World Petroleum

VENEZUELAN EDITION

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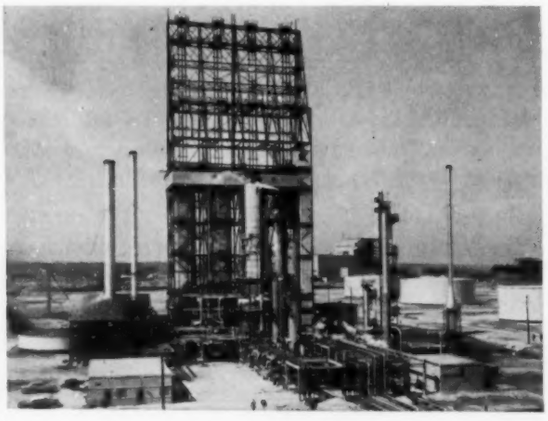

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THE MANAGEMENT PUBLICATION OF THE INTERNATIONAL PETROLEUM INDUSTRY

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THIS MONTH'S COVER

Casa de la familia Lopez Mendez, construida en el siglo XVII entre las esquinas de Monjas y Padre Sierra, a la entrada sur del actual Pasaje del Capitolio, demolida hace y algunos anos. Dibujada por Sanchez Felipe para Revista Shell.

Old and new contrast in Venezuela. Shown is the former Lopez Mendez house, constructed in the 17th century, between the corners of Monjas and Padre Sierra in Caracas, at the present entrance to Pasaje del Capitolio. Sketch is by Sanchez Felipe for Revista Shell. It is reproduced here through courtesy of Cia. Shell de Venezuela.

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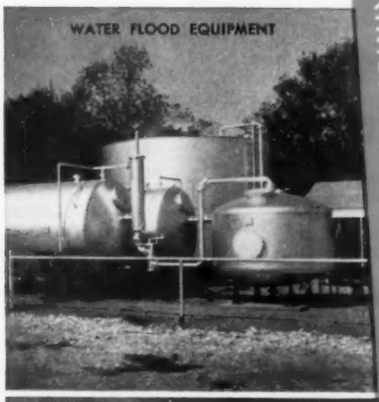

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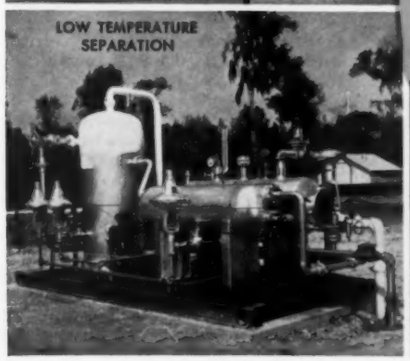

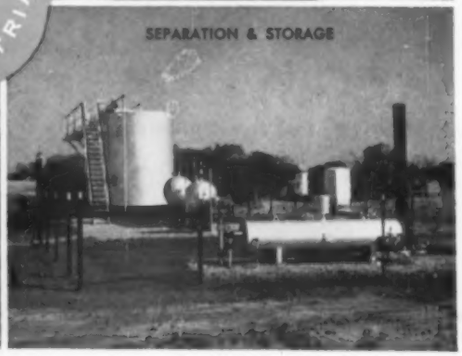

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International News and Notes

Shell In Bolivia

Shell Prospecting Co. Ltd. has formal approval for oil concessions of 1,969,000 hectares (about 5 million acres) in Bolivia. One concession is for 500,000 hectares in zone I, and the other is for 1,469,000 hectares in zone II.

Andes Oil Co. Inc. has formal approval for a concession of 498,000 hectares in zone I, Department of Santa Cruz.

To Explore In The Sudan

Four oil companies have applied for oil exploration concessions in the Sudan. Two are American, one British, and one German. The existing mining law is regarded as inadequate to attract great interest, and a draft bill to make changes is being prepared for submission to the parliament in the next session.

Argentina Promotes Private Oil

Three powerful organizations in Argentina are proposing entry of private oil companies to help develop the country's oil. Proposal came in a joint letter to Provisional President Aramburu. Organizations are the Chamber of Commerce of Buenos Aires, the Argentine Rural Society, and the Argentine Industrial Union. The letter suggests expansion by the government oil monopoly, YPF; an active role in oil by Argentine provinces; and, in areas not reserved to YPF, admission of private oil companies, foreign or domestic.

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Apply For Honduran Concessions

At least four groups have applied for oil and gas exploration concessions in Honduras — including Lynn Scott Holmes, of Corpus Christi, Texas, who applied to explore in the departments of Santa Barbara and Olancho, and later in Cortes and Atlantida. Last year, the government approved a contract for exploration in Santa Barbara and Olancho. Charles H. Daniels, Jr., of San Pedro Sula, Honduras: in Santa Barbara, Choluteca, and Valle; status unknown. William T. Fuhrhop, of Dickenson, Texas: in Yoro, Octotepeque, and Copan; status unknown. Allen Wright, Kenneth H. McKay, Reginald D. McKay, and Alfred McKay, of Acala, Fla: in departments of Olancho, Colon, and Gracias a Dios; status unknown.

Applications are a matter of record, and copies may be obtained by writing Rafael Jerez Alvarado, La Gaceta, Dairio Oficial de la Republica de Honduras, Tegucigalpa, Honduras. However, information on companies engaged in exploration and nature of their activities is not available.

The basic petroleum law of 1954 is being revised. Holders of oil concessions must pay Honduran income taxes, and provide schools, housing, hospitals, and the like for employees in the event commercial oil is found. Honduras officials recently said concessions are available only in the departments of Colon, Comayagua, and Mosquitia.

Sun Signs 2nd Colombia Concession Contract

Colombian Sun Oil Co. recently signed an agreement for a half-interest in oil concessions in Colombia covering 750,000 acres. This is its second contract involving exploration concessions in Colombia in less than six months. The wholly owned subsidiary of Sun Oil Co., Philadelphia, Pa., made the contract with Mobil Oil Co. de Colombia and International Petroleum (Col.) Ltd., original applicants for the concessions. Sun agreed to drill two exploratory wells to a depth of 9,000 ft each for its one-half interest. Pure Oil Co. of Colombia and United Carbon Co. will join with Sun in fulfilling obligations agreed to in the contract. Concessions involved are in the Sinu area of Colombia. There are eight of them, located in Loma Verde, La Ceiba, Santa Lucia, Arboletes, Nicocli, Martinica, Rio Mangle, and Caimar.

Ted C. Stauffer of Philadelphia, president of Colombian Sun and director of foreign operations for Sun Oil Co., signed the contract, and stated that additional exploratory work will be conducted by geological parties to be sent into the areas before drilling plans can be finalized. He pointed out also that, on December 31, 1956, Colombian Sun contracted with International Petroleum (Col.) Ltd. to drill one 9,500-ft exploratory well near Cartagena in return for a half-interest in a 450,000-acre tract.

Officers of Colombian Sun Oil Co., in addition to Mr. Stauffer, include B. E. Warren of Dallas, Texas, vice president and general manager; J. W. Timmins, Dallas, secretary; W. S. Woods, Philadelphia, treasurer and assistant secretary; and C. A. Pfahler, Philadelphia, comptroller. Earl Wilson, now of Dallas, will be manager of operations in Colombia.

Paraguay Imports Gasoline

A total of 39,923 cubic meters (about 251,116 bbl) of gasoline was imported into Paraguay during 1956 —or some 700 b/d—70% by Esso Standard Oil Co. and 30% by Shell Oil Co.

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French Union Production Up 34%

Production in the French Union increased 34.5% in 1956, and important discoveries were made in the Algerian Sahara (Edgele, Tiguentourine, and Hassi Messaoud) and on the Gabon coast. At present two goals are: production of 200,000 b/d of crude from the Sahara in 1960 and self-sufficiency in petroleum supply by the French Union by 1972.

Oil production of the French Union increased in 1956 to some 28,000 b/d. Natural-gas production was 327 mmcf annually, 17.5% greater than the previous year. Exploration and drilling for new fields and development of previously found areas was up by 13.6%.

The government continues to give every encouragement to the participation of private capital in the search for oil in the French Union. However, foreign capital is welcome on a minority interest only.

Esso Standard's new refinery at Bec d'Ambes, near Bordeaux, will start construction this year. Its capacity will be 12,000 b/d using 65% domestic oil; 20% Middle East oil; and 15% Venezuelan crude (for asphalt). Esso Standard's Port Jerome refinery in the Seine estuary will be completed by the middle of this year. It will have a crude storage-tank capacity of about 76,000 bbl.

Kuwait Exports Drop

After having reached 87% of normal production in February, Kuwait Oil Co. exports in March 1957 dropped to 24,599,683 bbl, or 68% of the export figure for the previous March. The drop from the large February figure is explained by the fact that in February many tankers completed their "turnaround" trips from deliveries to Europe all at once.

In the Neutral Zone, Getty Oil Co. exports increased by 42%, the bulk of which went to Egypt and Italy. Aminol exports decreased by 28% in March.

Exports of Kuwait Oil Co. for the year ending in March (crude oil, US barrels) went to destinations as follows:

United Kingdom	31,630,659
France	13,023,446
Holland	9,246,117
United States	5,713,187
Japan	5,303,204
Australia	2,512,560
Argentina	2,365,213
Belgium	1,183,595
Brazil	1,013,958

Others were scattered, including 950,616 to India.

Crude exports for March this year showed some 360,000 bbl to the USA; about 470,000 bbl to Egypt; 330,000 bbl to Italy; and 34,000 to Japan.

Sinai Has 20 Producers

Natiaonal Petroleum Co. of Egypt has 20 oil wells producing in the Sinai penninsula, some 18 are in Belayim and two in Wadi Feiran, NPCE operates concessions held by the Egyptian Cooperative Petroleum Soc. until Eastern Petroleum Co. takes over.

Spain Refines Shale

Operations of oil refineries in Spain in the quarter of 1957 cover the bituminous shale plant near Puertollano of Empresa Nacional Calvo Sotelo; of the plant of REPESA (Refineria de Petroleos de Escombreras SA.) near Cartagena; of plant of CEPSA (Compania Espanola de Petroleos) near Santa Cruz de Tenerife, Canary Islands.

At the shale plant, some 181,000 metric tons of shale were treated in the three months. A total of 18,925,000 liters (about 119,000 bbl) of crude oil; 1,762,000 liters (463,168 gal) of gasoline; and 697.7 metric tons of ammonium sulfate was produced.

At the REPESA plant, crude runs to stills were 4,469,049 bbl, or 49,656 b/d. Major product was residual fuel oil, some 2,026,292 bbl, with distillate next with 1,040,334 bbl; then gasoline and naphthas other than aviation gasoline at 943,463 bbl.

At the Canary Islands plant, crude runs to stills came to 524,357,400 plus unfinished oils rerun of 31,821,914 metric tons. The daily average was 6,180,000 metric tons. Major product was residual fuel oil at 227,266,613 metric tons, followed by distillate at 146,838,857, and gasoline and naphtha other than aviation at 60,499,492 metric tons.

(Continued on page 166)

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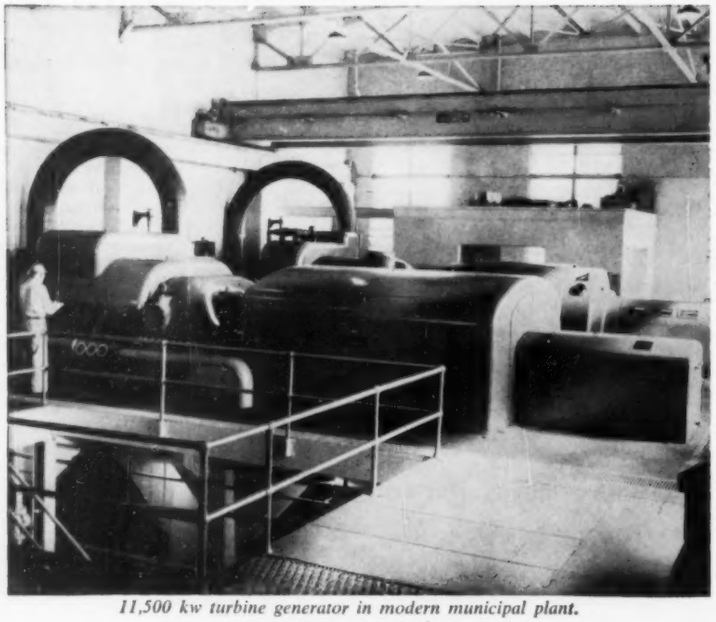

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WORTHINGTON

The sign of value around the world

By Joseph B. Huttlinger

Robert B. Anderson, an oil man who was named Secretary of the Treasury by President Eisenhower, becomes the only member of the Cabinet on the public record in favor of oil's income-tax depletion provision of 27.5%. During the presidency of Harry S. Truman, Mr. Anderson testified in defense of the allowance before the House Ways and Means Committee. He spoke for the Mid-Continent Oil and Gas Assn.

Formerly manager of the Waggoner estate, Vernon, Texas, Mr. Anderson, now 47, became Secretary of the Navy under President Eisenhower in 1953, and later Deputy Secretary of Defense. He resigned to take a top role with Ventures Ltd., worldwide mining enterprise. While in government, he played a role in the cabinet-committee report of February 1955, which suggested crude and residual-oil imports to the USA be limited to the ratio they held in 1954. The report also suggested a law to ease up federal price and other controls over natural-gas producers.

Because the Treasury post is of vital importance, and because Mr. Anderson has a close personal relationship with the President, Mr. Anderson is likely to be the No. 1 man in the President's official family.

Three Courses for Import Cutback

President Eisenhower sees three courses ahead, if there is to be action to limit imports of crude petroleum. One is to establish quotas; another is to raise the tariff far higher than at present, which is negligible; the third is to appeal to oil importers to cut back voluntarily. The last is winning favor in administration circles, but many urge any appeal be coupled with concrete plans to do the job. Thus, the idea of a voluntary agreement among oil importers is being talked over, and opinion of the Department of Justice is sought.

What area is to suffer if imports to the USA are cut? Chiefly, the Middle East, which is sending 350,000 b/d to the United States. All plans to cut back give preferred treatment to (1) oil from Canada and Mexico, and (2) oil from Venezuela and other Western Hemisphere countries. Defense access is one reason, but the growing number of USA independent producers in these areas is another. These two areas, meanwhile, can provide all and more of the crude oil allowed under existing, suggested formulas—10.3% of domestic production. Thus, there could be no oil allowed from other areas.

Gas Legislation Dies

The bill to ease up price and other controls over natural-gas producers may get through the House this year, but not the

PIPE LINE

Senate. Thus it will be next year, at the earliest, before the measure can be completed and sent to the White House. President Eisenhower seems convinced something is needed, and recently told a press conference he objects to "public-utility control" at the gas well. The Harris-O'Hara measure is designed to end this.

Earlier, the way had appeared clear for passage of a gas bill this year, but aides of the President came out with two surprise objections. They asked amendment to let the Federal Power Commission consider "costs" in setting rates. And they asked changes so FPC could roll back prices in existing contracts. The picture then became confused. Industry said both amendments make the bill "intolerable." Then, FPC Chairman Jerome Kuykendall got out of step with the Eisenhower administration. He favored the costs amendment, but opposed government powers to revise existing contracts.

Moving to clear up administration views, President Eisenhower wrote a letter, June 7, to Chairman Oren Harris (D., Ark.), of the House Commerce committee, saying the amendments were offered "as of possible desirability, but do not represent my fixed conclusions."

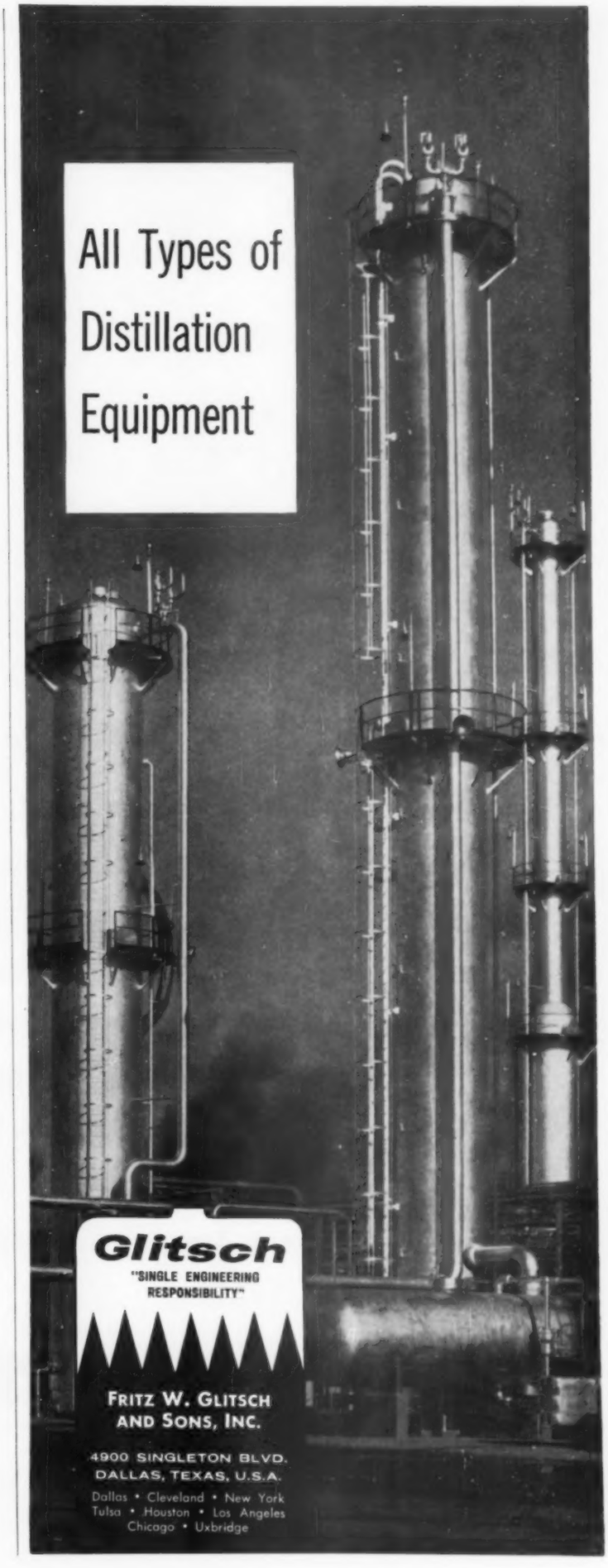
He added: "Whether or not they are adopted, I wish to reemphasize the importance of enacting natural-gas legislation at this session of Congress."

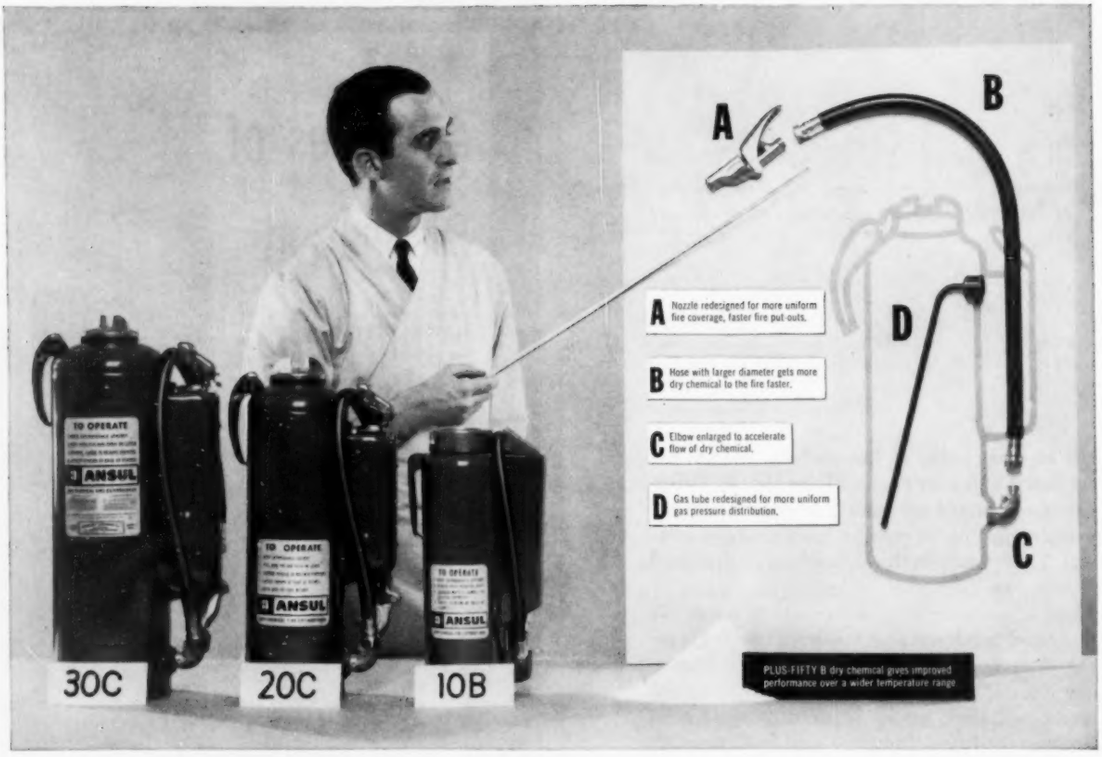
Good-Faith Bill Scrapped

A major antitrust measure up for study this year appears headed for the scrap heap—barring a miracle. This is S. 11, the controversial "good-faith" pricing bill, the subject of extensive hearings before a Senate Judiciary subcommittee. Major oil companies and oil jobbers fought it vigorously, but many small business spokesmen came out for it. The measure would forbid price discrimination, even in good faith, to meet competition if there is a tendency to lessen competition or to create a monopoly. Now, a cut-rate price, for gasoline or other commodities, is legal, if given to meet competition.

Against Divorcement

The gasoline end of the petroleum industry of the USA suffers from price discrimination, price fixing, price wars, subsidies to selected retailers and cut-rate sales to offbrand marketers. This is the view of a House Small Business subcommittee which studied the matter in hearings in Washington, Denver, Los Angeles, and Chicago. The subcommittee feels major oil companies could do a lot to correct the troubles by selling to all retailers at the same price. The subcommittee suggests more enforcement by states and the federal government of antitrust laws. It comes out against a divorcement bill at this time. This would forbid major oil companies to own and operate retail stations. END




A
B
C
D
A Nozzle redesigned for more uniform fire coverage, faster fire put-outs.
B Hose with larger diameter gets more dry chemical to the fire faster.
C Elbow enlarged to accelerate flow of dry chemical.
D Gas tube redesigned for more uniform gas pressure distribution.
PLUS-FIFTY B dry chemical gives improved performance over a wider temperature range
30C
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Important design improvements in these Ansul Extinguishers give you more fire fighting power at no increase in price. Three years of research and more than 2000 fire tests turned up some significant new information on dry chemical extinguishment. Ansul engineers were able to design these findings into three new extinguisher models, the 10B, 20C and 30C. Result, greatly increased fire fighting power. All Ansul equipment is backed by a five-year warranty. This is the best way we know to say Ansul fire extinguishers are the finest of their kind made anywhere.

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Consolidated "Maxiflow" Safety Valves
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Canadian Notes

Trans-Canada Boosts Gas Price

Trans-Canada Pipe Lines Ltd., Calgary, has boosted the price it will pay producers in western Canada for natural gas to supply its west-east line. The company has offered contracts under which it will pay 12 cents per MCF, an increase of 20% over a previous offer of 10 cents. Action reflects greatly expanded markets leading to stepped-up competitiveness for Canadian gas. Trans-Canada now has a permit to export 183 billion feet a year from Alberta, and the forecast demand in eastern Canada far exceeds all original estimates of requirements.

West Section Trans-Canada Line Under Way

Spring construction on western section of Trans-Canada Pipe Lines natural-gas line from Alberta-Saskatchewan border to eastern Canada, got under way, May 9, at Pense, 15 miles west of Regina. Mannix Ltd., of Calgary, contractor building Sect. 3 of the 34-in. line, is now working on all phases of construction, and in the kick-off area the pipe has been ditched and covered.

Recommends Decentralized Operations

A minimum of "apron-string control" is the prescription recently given to American businessmen for successful operation of a business in Canada by W. O. Twaits, executive vice president of Imperial Oil Ltd. He suggests "a maximum of decentralization, as well as development of Canadian personnel and Canadian shareholding interest, all founded on a detailed study of Canadian conditions." "There should be a minimum of preconceived notions based on US experience."

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Homestead Acquires Pennant

Canadian Homestead Oils Ltd., Calgary, has completed acquisition of Pennant Drilling Ltd., which previously was owned principally by Crescent Corp., of Tulsa, Okla., according to announcement of Canadian Homestead President E. H. Laborde, who states the acquisition will enable Canadian Homestead to accelerate its exploration and development programs in western Canada. Pennant will operate as a separate division, with no changes in policies or personnel.

Pennant's gross revenues from operation of its drilling equipment totaled $2,199,475 in 1956—an increase of 47% over previous year.

Texas Gulf Sulfur Joins at Okotoks

Texas-Gulf Sulfur Co. will join Shell Oil Co. and Devon-Palmer Oils Ltd. in establishment of the 300-ton-per-day sulfur plant previously announced for the Okotoks gas field district in southern Alberta. Announcement of Texas-Gulf's participation was made in Calgary by officials of the three companies. Devon-Palmer and Texas Gulf will share the cost of building the plant and field installations. Texas-Gulf will operate the plant itself, while Devon-Palmer will operate the field, which was discovered by Shell in 1951.

To Study Cross-Country Line

Walter J. Levy, New York oil consultant, is being asked to make a comprehensive study of the idea of a crude-oil pipeline from western Canada to Montreal. A group of independent Canadian producing companies is reported about to sign a contract with Mr. Levy to do the job. The supply of crude, the market for it, the cost of the line and of transportation would be among the factors considered. A six-months study is contemplated. A number of Canadian producers feel there are "excellent" chances such a line would be feasible.

Peace River Gas Discovery High

High interest in the discovery of new oil wells in the Peace River area of Calgary has given way somewhat to the craze for gas wells.

Union Oil Co. of California brought in four producing oil wells 85 miles east of Peace River in the deep "bush." The Granite wash is producing 38-gravity oil from 4,700 ft. Bailey-Selburn Oil Co. made a strike at Cutbank, 70 miles north of Grande Prairie. The sand is producing 34.9 gravity oil at 4,600 ft.

But the real excitement now is gas wells. First substantial discoveries were made in 1949 and 1951. By 1953 reserves in that area were estimated from one to 2.3 trillion cubic feet for British Columbia and 441 billion for Alberta. Gas is expected to flow to gas-hungry Vancouver and Seattle this fall through a 650-mile 30-in. pipeline, not including gathering and distributing systems. Initial flow is expected to be 200 million cubic feet per day. The project is more than three-quarters completed, costing in the neighborhood of $120 million. The pipe crosses one mountain pass at 2,850 ft and another at 4,700 ft above sea level.

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Yukon's Eagle Plain Active

F. H. Collins, Yukon Territory commissioner, predicts incalculable economic results in Canada's Yukon should oil-drilling projects in the Eagle Plain reservation result in development of a new field. He pointed out that considerable activity is under way in that region, and will continue in 1958. Should this promising oil field be brought in, a new activity and era will be born in the territory—with economic results beyond calculation at this time.

Peel Plateau and Exploration Ltd., Toronto, has completed a massive move of drilling equipment to the northern site. Peel Plateau's holdings cover 8,000,000 acres in the Northwest Territories and the Yukon. The first well to be drilled in its projected drilling program probably will be located on the Eagle Plain reservation in the Yukon.

To Break Even In 5 Years

According to President N. E. Tanner, Trans-Canada Pipelines Ltd. expects to "break even" on its vast west-east 2,250-mile pipeline operations at the end of 5 years. This he estimated on the basis solely of domestic use of natural gas. This could be speeded by export of natural gas to the USA.

West Averages Half Million Daily

Crude production in western Canada has averaged 522,500 b/d. By months, the production was:

	Barrels Per Day
January	543,700
February	526,300
March	513,300
April	529,000

Crude exports from Canada to USA were:

	To USA (Barrels Per Day)	*To California (Barrels Per Day)*
January	179,000	33,370
February	153,900	21,000
March	153,300	23,000
April	168,000	36,000
May	187,000*	59,700

*Based on refiners nominations.

British Dominion Co. to Explore Indonesia

New Britain Dominion Oil Co. Ltd. has announced in Calgary, Alberta, that it has concluded an agreement representing the first step in the acquisition of an interest in substantial general exploratory permits in Sumatra, Java, and Borneo in Indonesia. A portion of these lands immediately adjoins oil fields of Royal Dutch-Shell. Preliminary exploration will be started as soon as possible, and technical personnel to conduct this work will leave for the Far East shortly. Preliminary work will be under the direction of Ball Associates, who made a recent report on the properties.

Rejects Alaska-Yukon Pipeline

The Board of Transport Commissioners has rejected an application by Alaska-Yukon Pipelines Ltd., Edmonton, for permission to construct a 109-mile oil products line from the British Columbia-Alaska border to Haines Junction in the Yukon Territory. The board will give reasons for its decision later, in a written judgment. A company official in Calgary said no appeal could be contemplated until reasons for the rejection have been stated.

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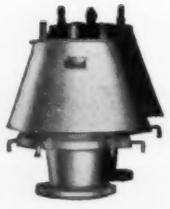
1

V-130 CONSERVATION REGULATORS—Exclusive, service-proved construction assures tight, leak-proof closure fully up to operating setting—quick opening—and greater flow capacity size for size and pressure for pressure than ever before available. Never a reported case of freeze-up. 6″, 8″, 10″ and 12″ sizes.



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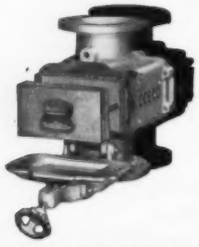
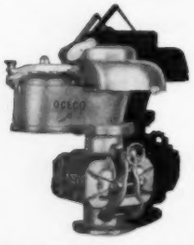


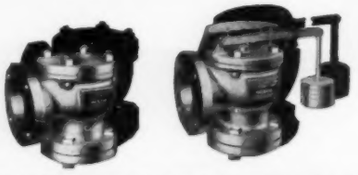
TYPE "21-E" FLAME ARRESTORS feature semi-steel housings that can withstand long exposure to fire and aluminum or stainless steel "banks." The banks have vertical straight-through passages—and are "extensible" for easy cleaning. 2″ to 12″ sizes.

3



TYPE "BE" VENT UNITS—Combination of an Oceco Type "21-E" Flame Arrestor with either aluminum or stainless steel extensible bank and any of the different types of Oceco Vent Valves. 2″ to 12″ sizes.

4



V-103 VACUUM RELIEF AND V-106 PRESSURE RELIEF VALVES are furnished in 3″ x 3″; 4″ x 4″; and 6″ x 6″ sizes. Vacuum settings from 1½ oz. to 1 lb. per sq. inch. Pressure settings from 2 lbs. to 30 lbs. per sq. inch. Working temperatures up to 500° F.

5

WATER DRAW-OFF VALVES permit water to be drawn from the bottom of storage tanks. Unique double valve construction enables the valve to be serviced without the inconvenience—and expense—of emptying the tank. Non-corrosive construction. 2″ x 1½″; 3″ x 2″ and 4″ x 3″ sizes.

6

V-136 COMBINATION PRESSURE AND VACUUM RELIEF VALVE — designed specially for nitrogen solution, ammonia and other services. Pressure disc is spring loaded to customer's specification—pressure-tested—set and sealed at the factory. 10 lbs. to 100 lbs. pressure. 2 oz. to 1 lb. vacuum.

7 **V-108-A EMERGENCY PRESSURE RELIEF VENTS**—provide instant relief from excessive internal tank pressure resulting from unusual conditions, preventing explosions. Cast or fabricated; steel or aluminum construction. Stem guided self closing or manual closing types. Sizes from 6″ to 24″.

8 **V-114 INTERNAL TANK VALVES** are provided with a fusible link that melts when subjected to fire, closing the valve instantly, and cutting off the flow from the tank. 3″ to 18″ sizes.

9 **V-109 STILL TYPE VALVES** combine vacuum and pressure relief in a single valve. 3″, 4″ and 6″ sizes. Pressure settings from 2 lbs. to 30 lbs. per sq. inch. Vacuum settings from 1 oz. to 10 oz. Temperatures up to 500° F.

10 **SWING JOINTS** of efficient double elbow design permit liquids to pass through with a minimum of agitation and pressure drop. Screw, flanged, and combination screw and flanged styles. 9 sizes from 3″ to 16″.

11 **TANK WINCHES** are worm geared and self locking to hold the swing pipe in any position. 3 types for different load and cable wrappings. Built with self lubricating graphited bearings, and removable cranks to prevent tampering.

12 **CABLE SHEAVE BRACKETS,** with one outside and two inside sheave wheels mounted on stainless steel axles, bring the cable out at normal angle through a stuffing box minimizing friction.

13 **GAUGE HATCHES** provide a gas tight closure for gauging, sampling and taking temperature readings. Pedal type hatch opens with a natural straight downward foot movement. Flanged or screw mounting. Also clamping cover type for pressures from 2 oz. to 15 lbs.

14 **OCECO ROOF MANHEADS** provide a gas tight closure on the tank roof. White metal or composition seating ring. Furnished in 20″ size only.

TANK GAUGES—Wide variety of types for cone, floating and expansion roof tanks including:

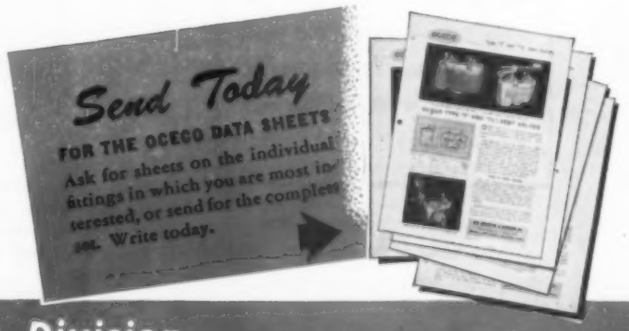
(1) **G-61 Liquid Level Indicators**—gauge board target reading type.

(2) **G-62 Liquid Level Indicators**—vapor sealed to 28 oz. blow-out pressure—gauge board target reading type.

15

(3) **No. 30 Tank Gauge.** Highly accurate. Completely automatic. Easily adapted to remote reading. For installation on either new tanks or tanks already in service. Many new outstanding features. Write for fully descriptive bulletin.

16 **No. 40 GAUGITS** for gauging the liquid level, water bottom, taking temperature readings and sampling manually;—but without relieving pressure on the tank, or exposing the gauger to fumes. Portable or permanent installations.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The 14 wells in this particular project were logged with 1¾" O.D. McCullough Radiation Well Logging instruments, averaging 1½ hours working time per well.

Because of the heavily saturated brine solution, other types of logging instruments had not been able to provide required information. All McCullough logs were sharp, clear and detailed. Location of casing collars and bottom of pipe, information that had not been obtainable before, was clearly indicated.

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Radiation Well Logger

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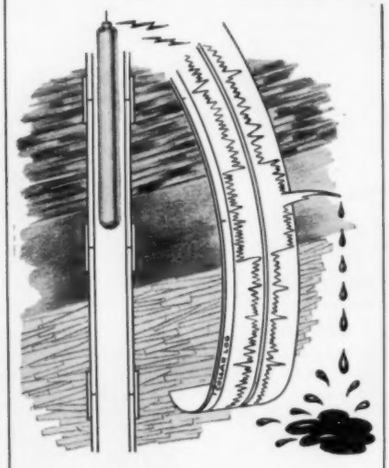
Total depth of this Kansas oilwell was 3648'. 5½" O.D. 14 lb. casing had been set to bottom and cemented.

McCullough's Radiation Well Logger obtained Gamma Ray and Neutron Curves and a simultaneous collar log. Logging information was correlated with the operator's drilling log and three four-foot zones were picked as possibly productive.

The three zones were perforated, one at a time, by 3¾" O.D. McCullough Standard Casing Glass Jets in Steel Strip Carriers. A total of 52 shots were fired.

The lower zone proved to be water bearing and a bridge plug was set above the perforations, sealing off the zone. Upper zones were productive and made approximately seven barrels of oil per hour.



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Well was then acidized and on test made 40 barrels per hour, or 960 barrels of oil per day. This was the best well in the field.

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The simultaneous recording of a collar log means placing the perforations exactly where they are wanted—fully covering the productive formation. And, as in the above case, this means "best possible production"—the best well in the field.

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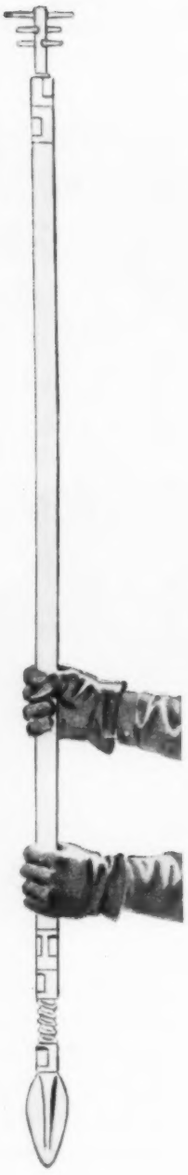

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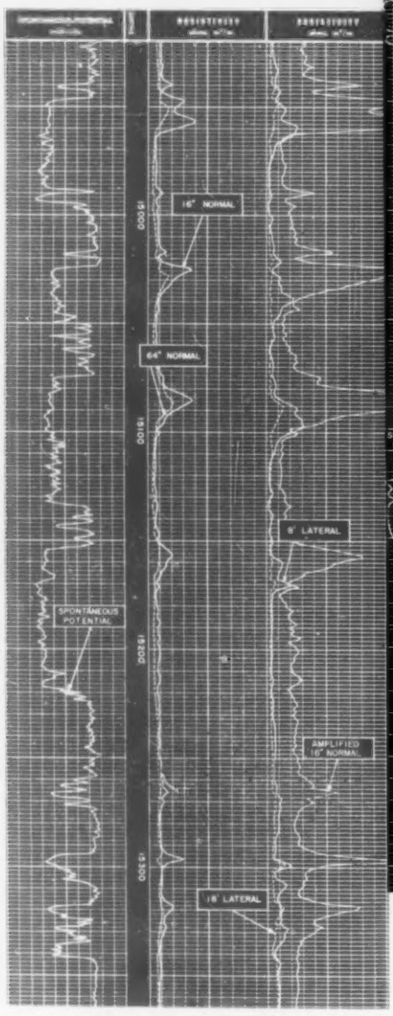

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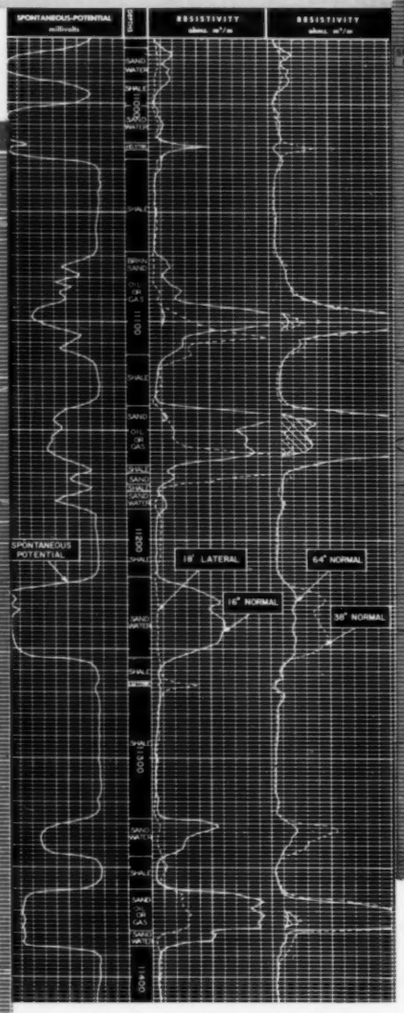

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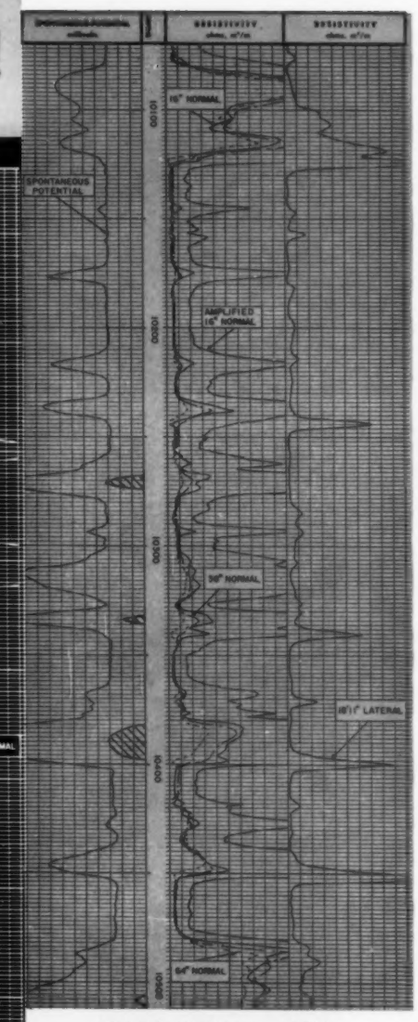

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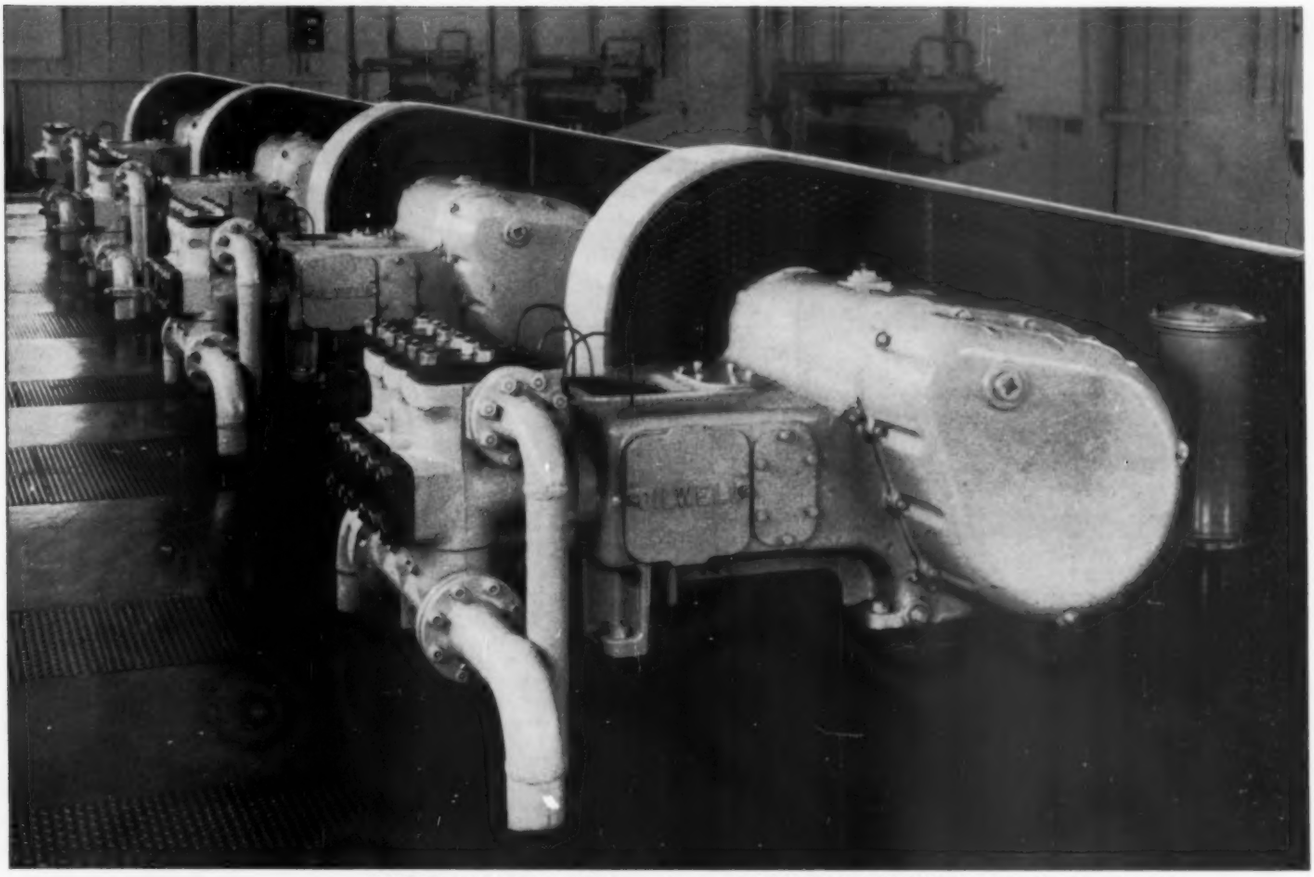


HUNDREDS *of "Oilwell" waterflood pumps have pumped* **HUNDREDS OF MILLIONS** *of gallons with only routine maintenance.*

Let us help you plan for WATERFLOODING!

THERE'S nothing particularly new about waterflooding. "Oilwell," for example, has been building pumps for the purpose since 1927. Nevertheless, more and more new waterflooding practices are being uncovered every day, and it's good business to keep informed on the situation.

You'll find a real storehouse of practical experience tucked under the hat of your "Oilwell" representative. He gets around and understands the basic problems encountered in current waterflooding practices. Needless to say, he's more than willing to discuss them with you.

And, naturally, he's in the very best position to talk about the outstanding line of "Oilwell" Plunger Pumps—available in a great range of displacements, working pressures, gear ratios, and fluid-end materials. He can also help you select automatic controls, metering equipment, prime movers and manifolding materials.

Of course, you'll want specialized engineering assistance in installing any waterflood project. But during the planning stages it's good common sense for you to capitalize on our wide experience and take advantage of our time-proven services.

OIL WELL SUPPLY

DIVISION UNITED STATES STEEL CORPORATION

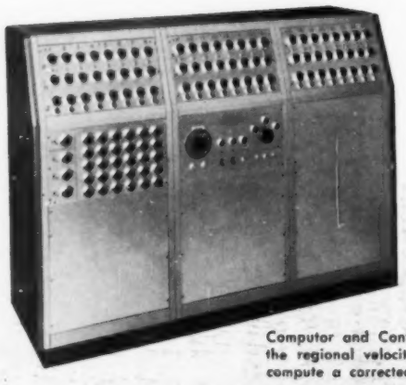
Executive Offices—DALLAS, TEXAS
Export Office—
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

Area Offices— CALGARY, ALBERTA
CASPER, WYOMING.....COLUMBUS, O.
DALLAS, TEXAS.....HOUSTON, TEXAS
TULSA, OKLA.....LOS ANGELES, CALIF.

Branches Serving All Oil Fields

USS TRADE MARK "OILWELL" TRADE MARK

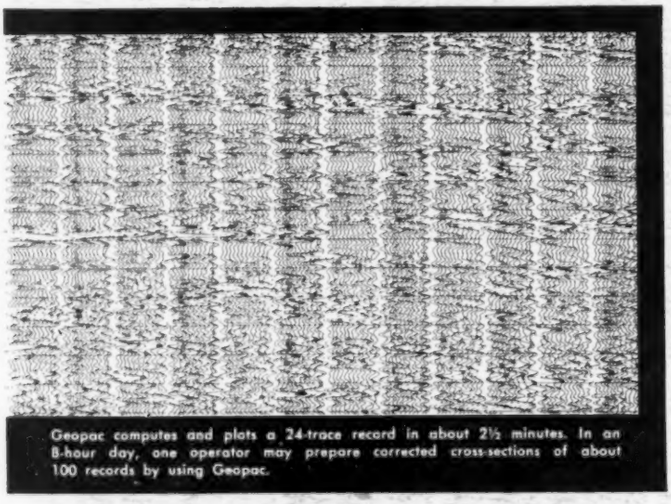
UNITED STATES STEEL



Computor and Control Section — this section uses the regional velocity, distance, and elevation to compute a corrected time for each trace.

GEOPAC

the fast, accurate, automatic seismic computor for economical data processing



Geopac computes and plots a 24-trace record in about 2½ minutes. In an 8-hour day, one operator may prepare corrected cross-sections of about 100 records by using Geopac.

Magnetic Play Back Drum and Seismic Amplifiers — this section supplies the computor with the necessary basic information for making an individual correction to each trace.

Plotter Console — this section prints conventional timing lines simultaneously for each trace section plot. All plotted records are timed properly, regardless of variation of the position of time-break on the magnetic tape.

Geopac, the automatic plotter and computor developed by General Geophysical, offers a more efficient, a more economical way of processing and presenting seismic data. Geopac facilitates computation through improvement in speed, reduction of human error, the ability to handle and correlate large volumes of seismic data, and by presenting the results in simple organized cross section.

By presenting corrected data in a cross-section in which relative distances are preserved, the Geopac permits the seismologist to identify pinch-outs quickly, and helps to identify multiple reflections. It also aids in identifying geologic faults. This easy to operate unit does the "dogwork," frees the seismologist from many routine details, gives reduced unit cost. Geopac — truly a new concept in seismic interpretation.

For additional information about the exclusive Geopac, write or call:

General Geophysical Company
Houston Club Building
Houston, Texas

General GEOPHYSICAL COMPANY
HOUSTON CLUB BUILDING • HOUSTON, TEXAS

General Geophysical Company de France (Int'l)
6 Square Rapp • Paris 7, France

General Geophysical Company de Venezuela, C. A.
Sociedad A. Consejo No. 15 • Caracas, Venezuela

WHEN YOUR CONTRACT IS WITH GENERAL, THE PERCENTAGE FOR SUCCESSFUL EXPLORATION IS IN YOUR FAVOR

How General Electric Drive Systems Help Lower Oil Well Drilling Costs

1. SIMPLICITY

Use of the electric drive principle eliminates many cumbersome mechanical components needed for other types of oil well drives. Rig sub-structure may be simplified, and set-up and maintenance time may be substantially reduced.

2. FLEXIBILITY

With General Electric drive systems, oil well drilling operations may be set up more quickly with improved space utilization and economy. Engine-generators and mud pumps may be located away from the drilling platform for easier site preparation on land and to give better weight distribution on offshore rigs.

3. PORTABILITY

With a General Electric drive system, an oil well drilling operation becomes more mobile. Components of an electric drive separate naturally into light, compact loads. Electric connections are easily made and broken and alignment problems are eliminated. Time and costs for moving equipment can be significantly reduced.

4. SPEED

Faster drilling is possible with the General Electric drive system because of more positive control and the fast response to electric power. Full generator standby protection and rugged, simple components cut production down-time.

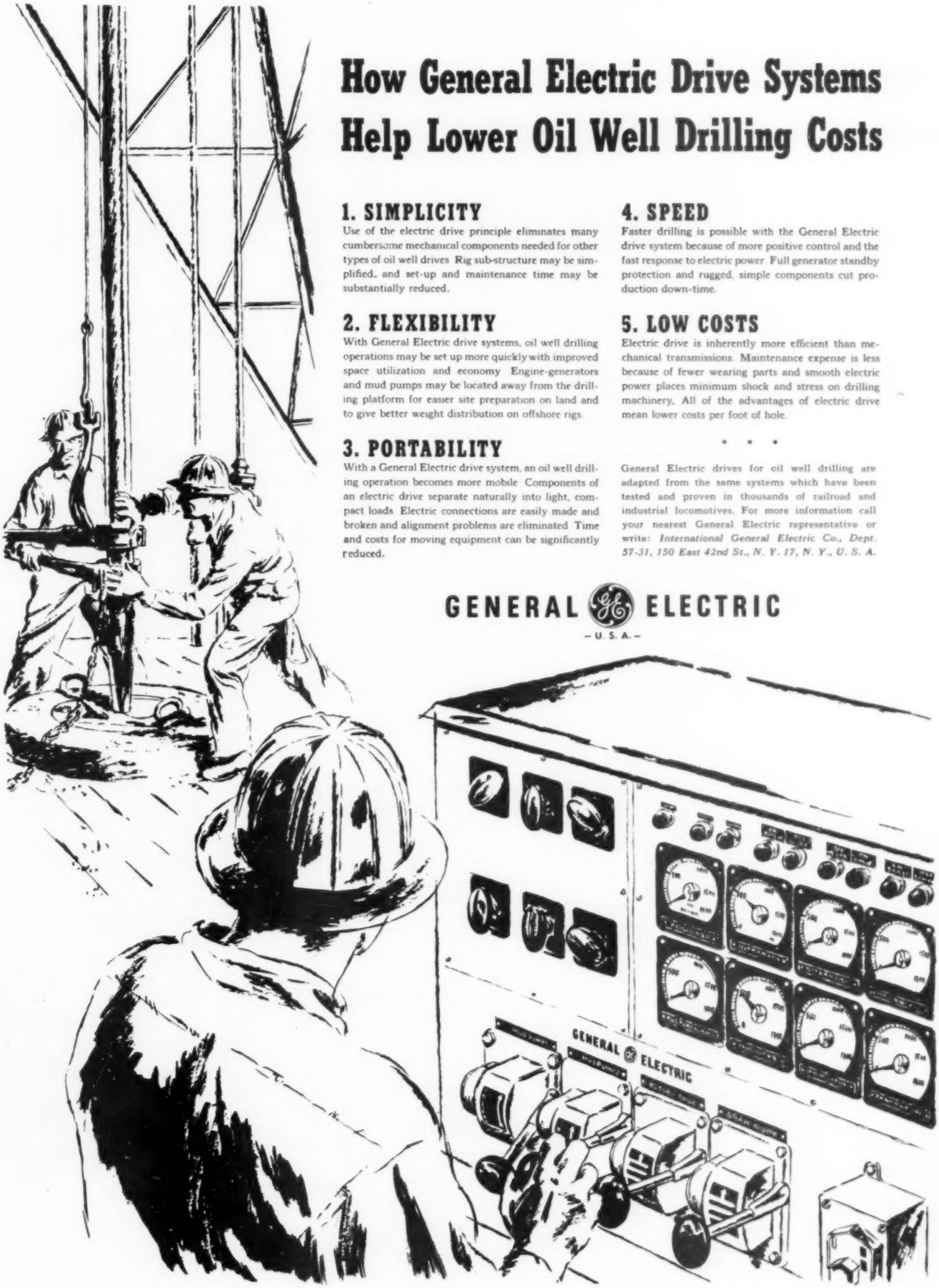
5. LOW COSTS

Electric drive is inherently more efficient than mechanical transmissions. Maintenance expense is less because of fewer wearing parts and smooth electric power places minimum shock and stress on drilling machinery. All of the advantages of electric drive mean lower costs per foot of hole.

• • •

General Electric drives for oil well drilling are adapted from the same systems which have been tested and proven in thousands of railroad and industrial locomotives. For more information call your nearest General Electric representative or write: *International General Electric Co., Dept. 57-31, 150 East 42nd St., N. Y. 17, N. Y., U. S. A.*

GENERAL ELECTRIC
– U. S. A. –



PETROCHEMICALS

another broad field for UOP service to oil refiners . . .

In its business of developing improved refining processes for the oil industry, Universal Oil Products Company has long been vitally concerned with effective means of producing the valuable chemical products from petroleum. The great worth of these petrochemicals to our national economy is recognized by everyone. They are vitally important to the refining industry, too, if refiners are to maximize the value of products from crude oil processed through their plants.

In the interest of the oil refining industry UOP has recently established a program of petrochemical process and marketing development. Under this program any refiner, anywhere in the free world, regardless of the volume of his operation will be able to enjoy the economic and operating advantages which the production of the petrochemicals most suited to this operation can provide.

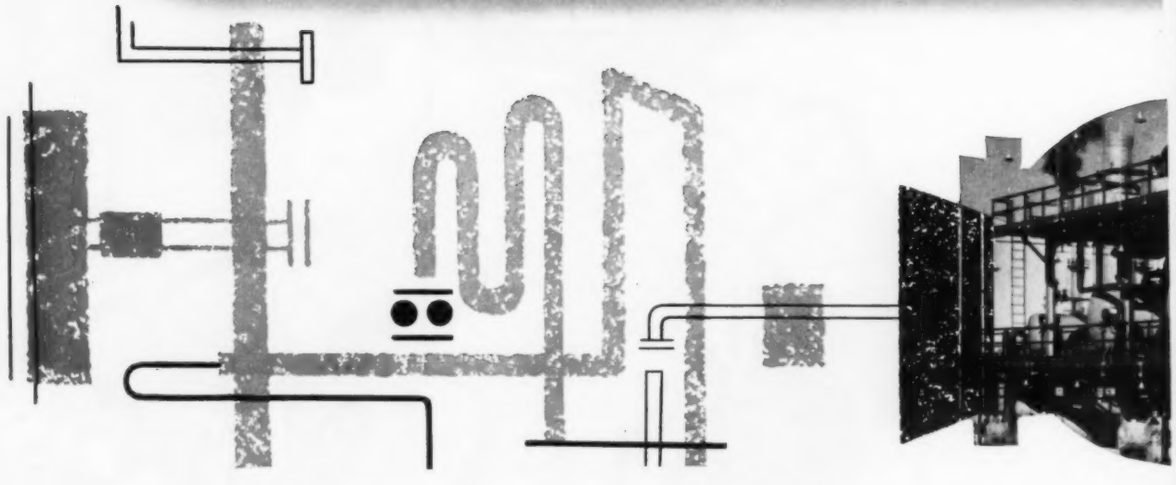
This new petrochemical program makes available to you, through UOP, a variety of petrochemical processes.

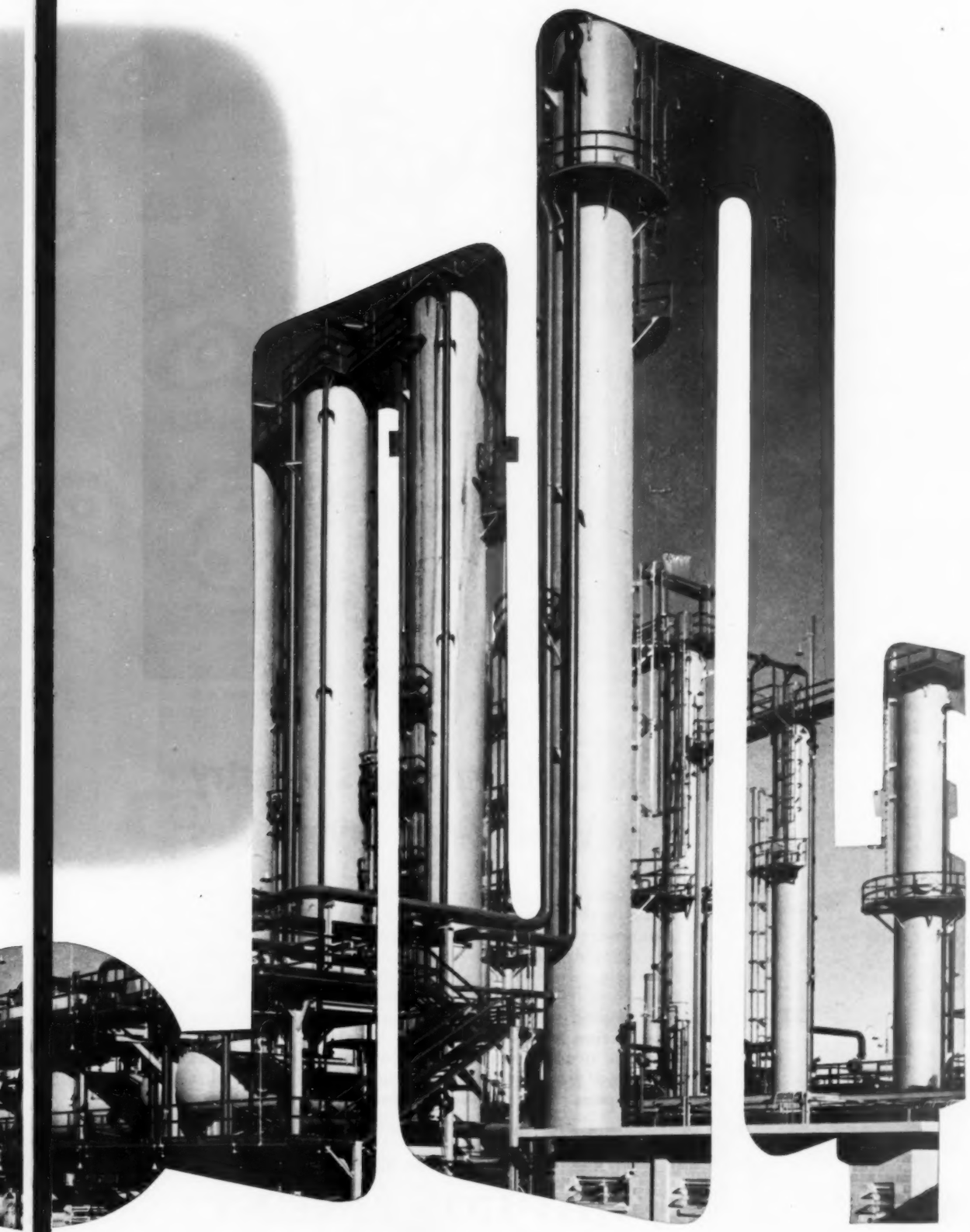
UOP

UNIVERSAL OIL PRODUCTS COMPANY

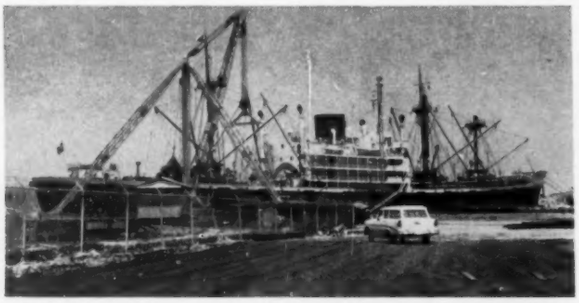
30 Algonquin Road, Des Plaines, Illinois, U. S. A.

More Than Forty Years Of Leadership In Petroleum Refining Technology





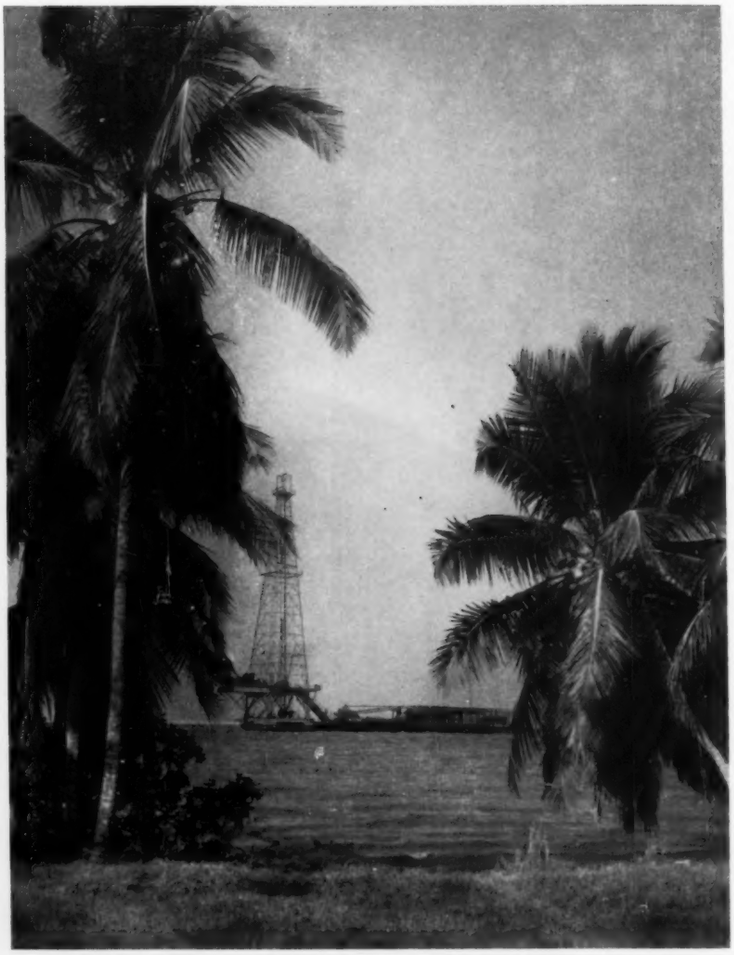
AERIAL VIEW of Lake Maracaibo in western Venezuela where Mid-Continent is now constructing another field store.



UNLOADING a freighter at Guanta, where vessels discharge cargoes of vital oil field supplies and equipment.

CUSTOMERS inside the Mid-Continent Anaco field store are surrounded by complete stocks of supplies and equipment.

THE MODERN Mid-Continent Anaco store (above) supplies oil men with their needs in a matter of minutes. Below is the Edificio Polar, location of Mid-Continent division offices.



OFFSHORE drilling on Lake Maracaibo where tropical foliage frames a familiar scene in the Venezuelan oil boom.

Mid-Continent Helps Industry Cut Venezuelan Inventories

In Venezuela—or wherever there is oil—you can rely on Mid-Continent Supply. Eastern Venezuela operators depend on Mid-Continent today instead of carrying large inventories. Mid-Continent has supplies available off-the-shelf from complete stocks at the store in Anaco. Another store is under construction in Maracaibo as part of Mid-Continent expansion to better supply Western Venezuela. Service around the clock in booming Venezuela is directed from headquarters at the Edificio Polar in Caracas. Rely on Mid-Continent—wherever there is oil.

Export Division: 45 Rockefeller Plaza, New York 20, N. Y. Cable: MIDCUMPORT NYK

MID-CONTINENT Supply Company

MID-CONTINENT BLDG. FORT WORTH, TEXAS

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

Wrong Way To Cut Plant Investment

Shortening the engineering effort required for a multi-million-dollar process plant may seem to be the easiest way to cut investment costs. Actually it may be the surest way to increase costs of materials and field labor, and to endanger the ultimate efficiency of the plant. Additional time spent on engineering before construction begins usually can save thousands of dollars in materials and thousands of man-hours in the field.

Better engineering is the basis of The M. W. Kellogg Company's construction business, and the reason for its reputation among leading oil refiners and chemical companies the world over. If your firm is contemplating new petroleum or petrochemical processing facilities, it will pay you to investigate Kellogg's better engineering approach to the problems of rising labor and materials costs.

REFINERY PROCESS DIVISION

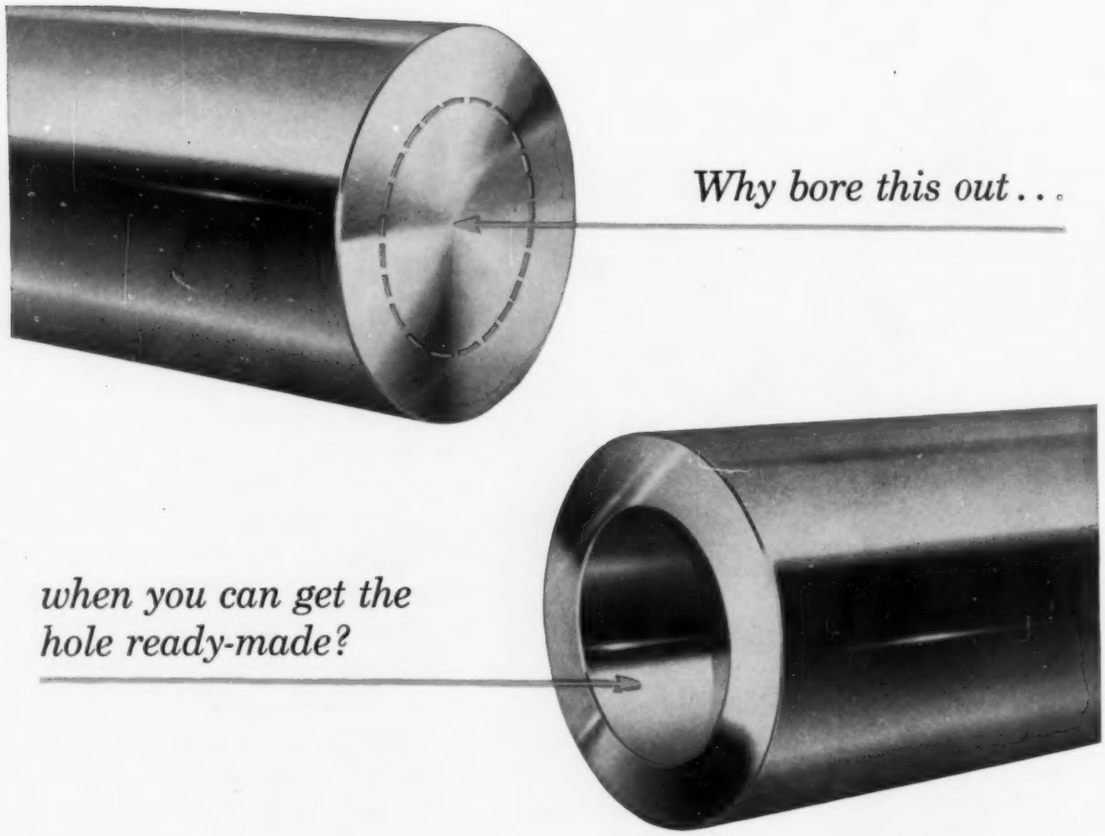
THE M. W. KELLOGG COMPANY

711 THIRD AVENUE, NEW YORK 17, N. Y.

A SUBSIDIARY OF PULLMAN INCORPORATED

The Canadian Kellogg Company Limited, Toronto • Kellogg International Corporation, London
Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas
Kellogg Pan American Corporation, New York • Societe Kellogg, Paris

M KELLOGG W



Save money on hollow parts by switching from bar stock to TIMKEN® seamless steel tubing

Check these savings you get when you make hollow parts with Timken® seamless steel tubing instead of bar stock:

1. **NO HOLE TO DRILL**—it's already there.
2. **ELIMINATION OF COSTLY BORING OPERATION** frees part of your screw machines for other jobs—adds machining capacity *without* adding machines.
3. **MORE PARTS PER TON OF STEEL** because there's less metal to hog out.

And with Timken seamless steel tubing you get better quality finished products. The piercing operation by which Timken seamless steel tubing is made gives the tubing its fine forged quality. A solid round is forged over a mandrel, thoroughly working the metal inside and out. Accurate temperature and piercing speed control combine to produce uniform, fine forged quality. And we maintain this quality from tube to tube, heat to heat, order to order.

Timken Company engineers are always ready to study your problems, recommend the most economical tube size for your hollow parts job—a size guaranteed to clean up to your dimensions. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN *Fine Alloy* **STEEL**

TRADE-MARK REG. U.S. PAT. OFF.

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS STEEL TUBING

Déle ALAS a su carro,

usando

Mobilgas

con

MC_4

La única gasolina de DOBLE ACCION

Su carro vuela con MOBILGAS! Ud. quedará sorprendido del gran poder de aceleración y de la gran suavidad de funcionamiento que da al motor de su carro o camión esta nueva gasolina de "doble acción".

La razón está en MC4, el revolucionario agente químico que aumenta la fuerza de combustión de la gasolina y además eleva la eficiencia de los motores a niveles jamás alcanzados, porque M.C.4....

1.-Suprime los depósitos gomosos que obstruyen el carburador.

2.-Aumenta el rendimiento de las bujías.

3.-Evita el encendido prematuro que causa el pistoneo.

4.-Proporciona arranque instantáneo y aceleración más rápida.

MC_4 { **MAYOR FUERZA DE COMBUSTION**
+EFICIENCIA MECANICA

¡Sólo MOBILGAS tiene M.C.4, el agente químico de doble acción!

90 años de experiencia a la vanguardia de la industria petrolera, respaldan la calidad de MOBILGAS, otro de los productos de los fabricantes de MOBILOIL, el aceite de los campeones.

Socony Mobil Oil Company de Venezuela

For catalytic reforming...

Forty refineries specified Clark

User	*Location*	*No. of Units*
Atlantic Refining Company, The	Point Breeze, Pennsylvania	2
BP Refinery (Kent) Ltd.	Kent, England	1
Burmah-Shell Refineries Ltd.	Bombay, India	1
Bahrain Petroleum Company, Ltd., The	Bahrain, Persian Gulf	1
Caltex Petroleum Maatschappij N.V.	Pernis, Holland	1
Compagnie Francaise de Raffinage	La Mede, France	1
Gulf Oil Corporation	Girard Pt., Pennsylvania	4
Gulf Oil Corporation	W. Pt. Arthur, Texas	4
*	Eastern Canada	1
McColl-Frontenac Oil Company Limited	Montreal, Canada	1
Ohio Oil Co., The	Robinson, Illinois	1
Phillips Petroleum Company	Phillips, Texas	1
Phillips Petroleum Company	Kansas City, Kansas	1
Pure Oil Company, The	Smith Bluff, Texas	1
Refineria de Petroleos de Escombreras, S.A.	Cartagena, Spain	2
Shell Oil Company	Wood River, Illinois	2
Shell Oil Company	Deer Park, Texas	1
Shell Oil Company	Houston, Texas	2
Shell Oil Company	Anacortes, Washington	1
Shell Oil Company of Canada Limited	Montreal, Canada	1
Shell (Refining) Australia Pty. Ltd.	Geelong, Australia	1
Sinclair Refining Company	Marcus Hook, Pennsylvania	2
Sinclair Refining Company	E. Chicago, Illinois	2
Societe Francaise des Petroles BP	Dunkirk, France	1
Societe Industrielle Belge des Petroles	Antwerp, Belgium	1
Socony Mobil Oil Company, Inc.	Paulsboro, New Jersey	1
Societe per l'Industria Italiana del Petrolio	La Spezia, Italy	1
Standard Oil Co. of California	El Segundo, California	2
Standard Oil Co. of California	Richmond, California	2
*	Central Kansas	1
Standard Oil Co. of Ohio	Toledo, Ohio	2
Sun Oil Company	Toledo, Ohio	1
D-X Sunray Oil Company	Tulsa, Oklahoma	1
Suntide Refining Company	Corpus Christie, Texas	2
Texas Company, The	Wilmington, California	1
Texas Company, The	Laurenceville, Illinois	2
Texas Company, The	Westville, New Jersey	2
Texas Company, The	Pt. Arthur, Texas	5
Tidewater Oil Company	Delaware City, Delaware	1
Wilshire Oil Co. of California	Norwalk, California	2

*Name furnished on request

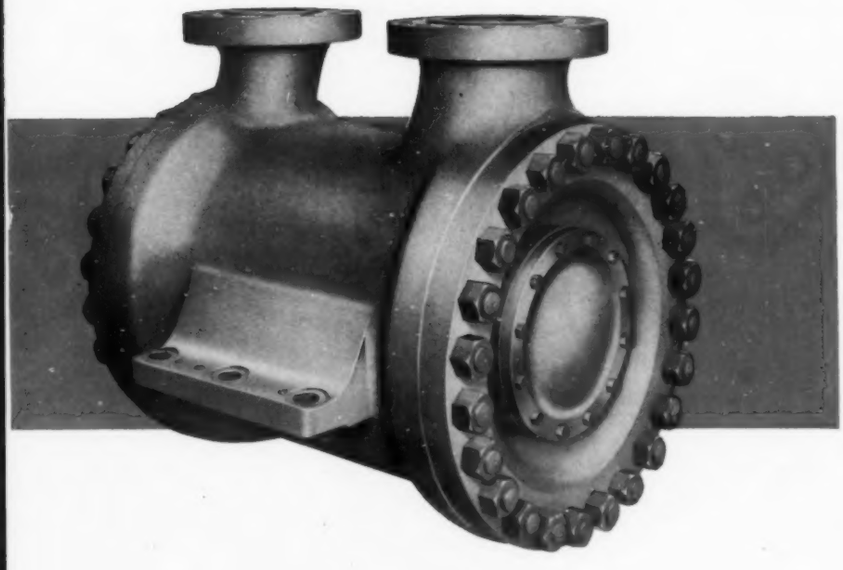
60% choose Clark

Vertically-split centrifugal compressors

Forty major refineries are using or have ordered Clark vertically-split centrifugal compressors for their reforming needs. That's over 60% of the total requiring centrifugal compressors.

We could mention many reasons why these Clark units outsell all other makes combined, but we prefer to let the facts speak for us. Remember 6 out of 10 are Clark . . . how about your next reformer?

CLARK BROS. CO., OLEAN, N. Y.
One of the Dresser Industries
Offices in Principal Cities throughout the World



CLARK®

Centrifugal Compressors

MATTHEW HALL & CO. LIMITED

Chairman's Statement

The Thirtieth Annual General Meeting of Matthew Hall & Co. Limited was held on 4th June, 1957, at Matthew Hall House, Dorset Square, London.

The following is an extract from the circulated statement of the Chairman, Mr. Bertram Baden, M.C., S.B.St.J., M.I.H.V.E.

In my statement last year I said that, although our order book was satisfactory, costs were continuing to rise and competition to increase. The turnover achieved by our parent company in 1956 resulted in an increased trading profit of £242,336 (against £191,554) but my warning was justified by the results of our South African subsidiary.

The level of work done by that company was maintained but the reduced margins caused a drop in the trading profit. Thus you will observe that the consolidated trading profit was £314,739 (against £341,621) and net profit after all charges, including taxation, £107,376 (against £141,710).

£60,000 has been transferred to general reserve and £25,000 appropriated for past service pensions. Your board recommends that a dividend of 30% (1955—30%) be paid by the parent company.

You will have received the explanatory letter concerning the proposed increase in borrowing powers which you will be asked to consider at an extraordinary general meeting to be held after this meeting.

NUCLEAR ENERGY.—Our Nuclear Energy Division has been occupied throughout the year and has designed and installed plant in connection with the Synchro-Cyclotron for the European Organisation of Nuclear Research at Geneva, and we also carried out in this country fabrication work for a nuclear energy project in France.

CHEMICAL, OIL REFINERY AND INDUSTRIAL ENGINEERING DIVISIONS.—Your company obtained orders for a fertiliser plant at Billingham for I.C.I. Ltd., and as sub-contractors to Blaw-Knox Company for a synthetic rubber plant at Hythe, Hants, for the International Synthetic Rubber Co. Ltd., together worth a total of about £6 million. Such complex industrial plants call for every mechanical service.

Work continues at the Alumina plant, Jamaica, which we started in 1951.

FEDERATION OF CENTRAL AFRICA.—Engineering contracts for the copper mines included the mechanical installation for a new 55,000 tons per annum electrolytic copper refinery tankhouse; electrical installation at the Kariba Gorge power scheme; air conditioning, sanitary, electrical, sprinkler and other services in flats, factories, hospitals, offices and hotels.

MATTHEW HALL (PTY.) LIMITED.—Work in the Union of South Africa included air conditioning, heating, sanitary, electrical and sprinkler installations for schools, cinemas, hotels, hospitals, refineries, mines, factories, office blocks, houses and flats, but due to a decline in the building industry competition has been very keen.

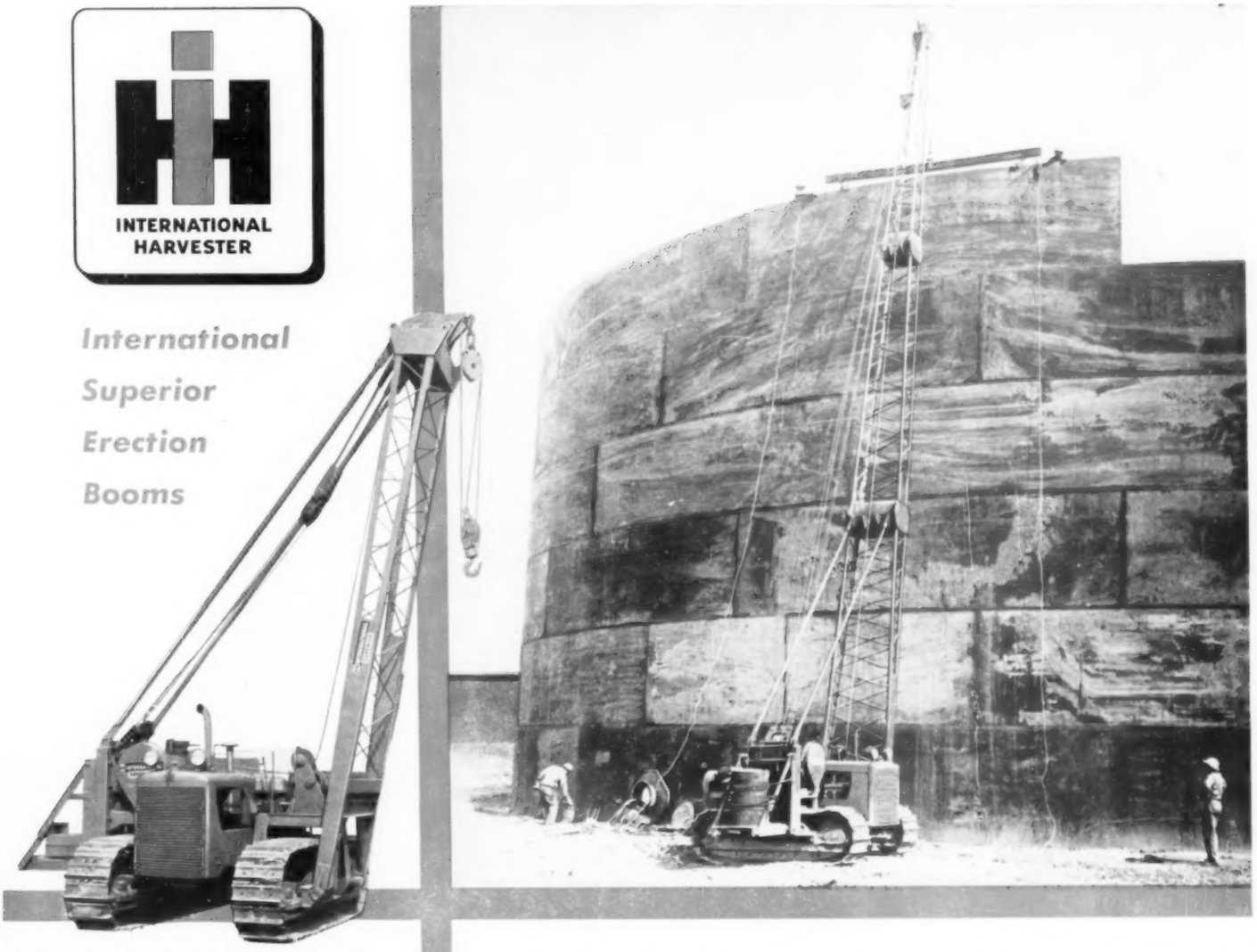
In 1957 pension and life assurance schemes were inaugurated for our office staffs in the Union and the Federation.

It gives me pleasure to express the thanks of the board to all employees at home and overseas for their energetic and enthusiastic work.

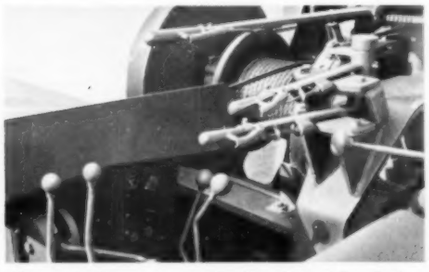
The report and accounts were adopted.

INTERNATIONAL HARVESTER

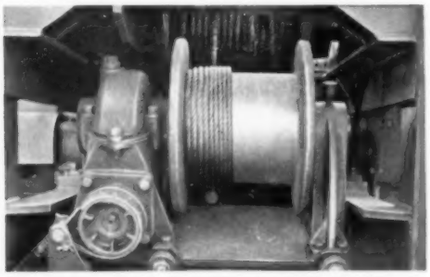
International
Superior
Erection
Booms



A hinged counterweight platform makes it unnecessary to carry excess weight either at the site or in transporting. Your on-the-job counterweight costs nothing—just add any weight handy, as necessary to make your lift.



All controls are conveniently placed for faster working and greater safety. Operator has excellent visibility. Note load cable safety shield.



Worm driven boom drum gives precision control up or down. The automatic boom drum brake gives maximum safety by holding the boom exactly where you want it.

THERE'S NO GAMBLE WITH BUILT-IN SAFETY, CONTROL AND VERSATILITY!

The International Superior EB-142 Erection Boom was designed and built in conjunction with one of the largest steel erection construction companies in the world. As a result, it has all the latest, most-wanted on-the-job features... safety and convenience of operation, advanced engineering control mechanism and all-around versatility of 1, 2 or 3 section booms.

The new super-powered International TD-14 diesel crawler has unsurpassed traction and flotation in mud and soft ground. The boom can be operated while tractor is in motion. Three, easily-assembled boom sections are available with a total reach of 60 feet —a boom height for every job from small pipe laying to high tank construction.

Talk to your IH distributor soon. Have him explain how the EB-142 lets you bid jobs lower and still make a greater profit. International Harvester Export Company, 180 N. Michigan Ave., Chicago 1, Ill., U.S.A.

INTERNATIONAL
CONSTRUCTION EQUIPMENT

World-Wide..

..Drilling is our business

Jungle or desert . . . mountains, sea or swamp . . . wherever oil is the goal, you'll find Loffland Brothers. Throughout the world, more and more oil producers rely on Loffland's dependable drilling to reduce their risks. Worldwide experience makes Loffland Brothers the contractor you KNOW will get the right men and equipment into any location for fast, efficient and economical drilling.

LOFFLAND BROTHERS CO. — **TULSA, OKLAHOMA**

Latin American Headquarters
MARACAIBO, VENEZUELA

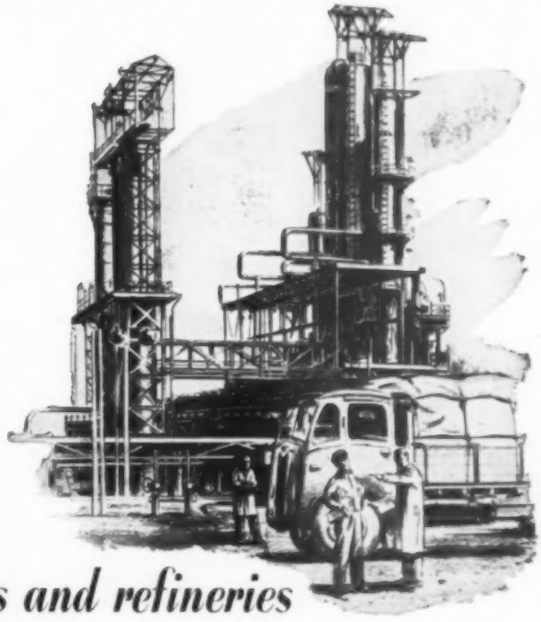
Contract and operational representatives in Calgary, Canada; Bakersfield and Los Angeles, Calif.; Denver, Colo.; New Iberia and New Orleans, La.; Tulsa and Oklahoma City, Okla., Fort Worth, Houston, Midland, and Odessa, Texas; Casper, Wyo.; Caracas and Maracaibo, Venezuela; Barranquilla, Colombia; and Puerto Limon, Costa Rica. For information contact these locations or write P. O. Box 1649, Tulsa, Oklahoma.

Wheels of industry the world over are turned

by

B
T-H

ELECTRIC MOTORS



in oilfields and refineries

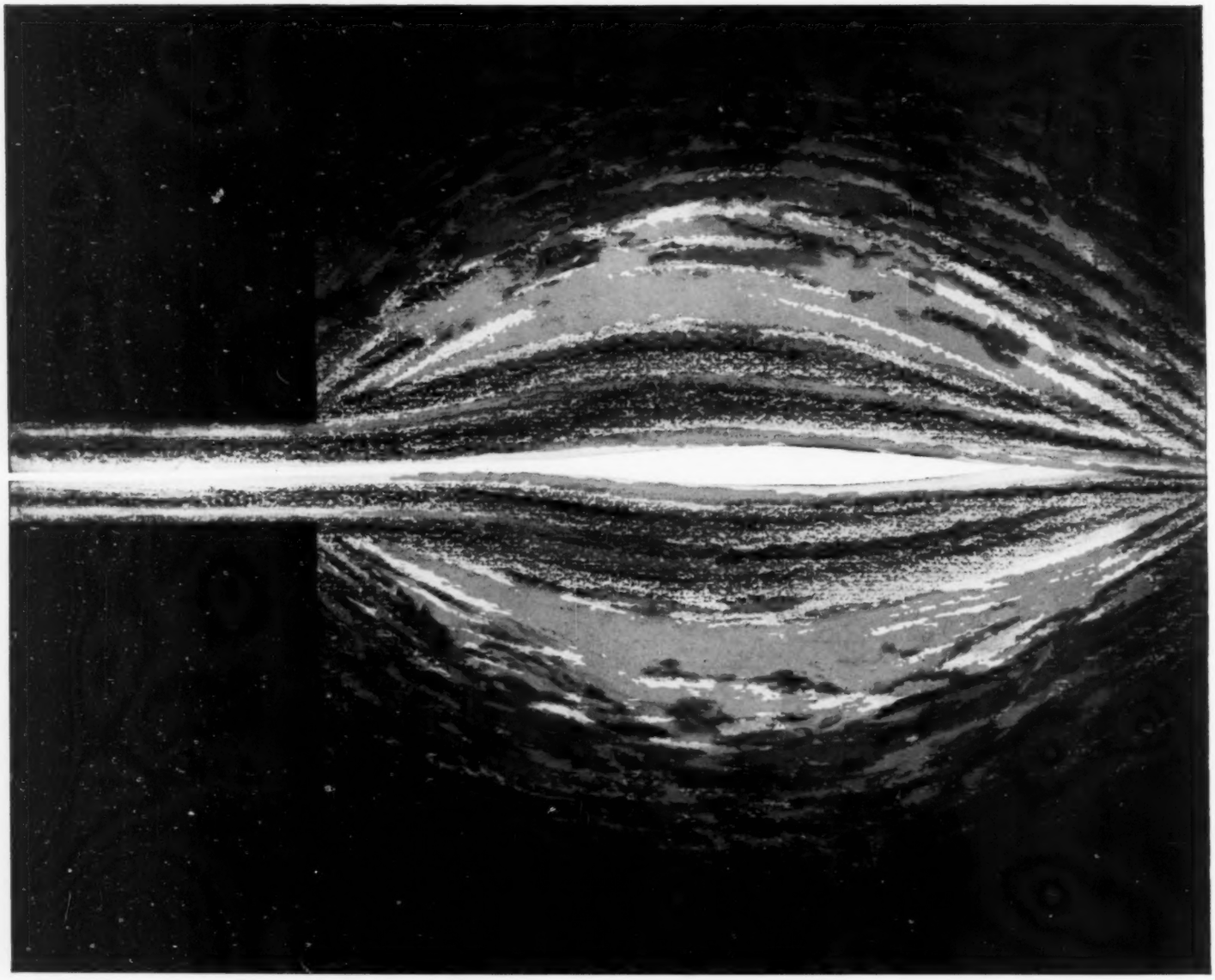
Whenever a power drive is needed, there is a BTH motor that will do the job efficiently and economically. In industries all over the world, BTH motors are helping to increase production. Over half-a-century's experience of this branch of electrical engineering enables BTH to offer the motor with the mounting, enclosure, rating and performance best suited to the application.

BTH factories are exceptionally well equipped to make both ***STANDARD*** *and* ***SPECIAL*** *machines in large quantities*

Member of the AEI group of companies

THE
BRITISH THOMSON-HOUSTON
COMPANY LIMITED, RUGBY, ENGLAND

A4704



...IN THIS PURE JET AGE

The technique of steel furnace boosting with a jet of pure oxygen stabilizes quality and batch uniformity.

This principle, whether applied to Open Hearth, Blast or Bessemer, enables manufacturers to widen still further their range of specialized quality steels.

Growing demands of scientific and industrial progress require speedier delivery in the face of increasing competition. It is vital that manufacturers employ this latest technique which shows greater economy and is only made possible by employing the proven principle of the Butterley on-site Tonnage Generator. This compact, efficient plant produced a continuous supply of Oxygen and/or Nitrogen at any desired purity and pressure, piped direct to the point of usage, in the exact quantity desired. Its efficiency eliminates production hold-ups by maintaining a constant supply, and maintenance costs are low.

The Butterley Company have acquired the sole production and sales rights of this, the most successful American Process, for the United Kingdom, British Commonwealth, and certain European countries.

If you can use oxygen, consult

BUTTERLEY FOUNDED 1790 **XYGEN DIVISION**

2

The Butterley Company Ltd., 9 Upper Belgrave Street, London, S.W.1. Telephone : Sloane 8172/3.

Current contracts include: British Celanese Ltd., Brymbo Steel Works Ltd., Imperial Chemical Industries Ltd., Steel Company of Wales Ltd., Stewarts and Lloyds Ltd.

Makers since 1790 of Railway and other Bridges • Constructional Steelwork • Unit Bridging • Overhead Cranes • Railway Wagons and Mine Cars • Meehanite Castings • Iron Paving • Mining and Sheet Metal Machinery • Wrought Iron Bars • Sewage ejectors and Pumps • Wool Washing Machinery • High Quality Bricks • Aglite lightweight Aggregate

BUT 8456

HAMMOND LATINO-AMERICANA

since 1947, has erected

over

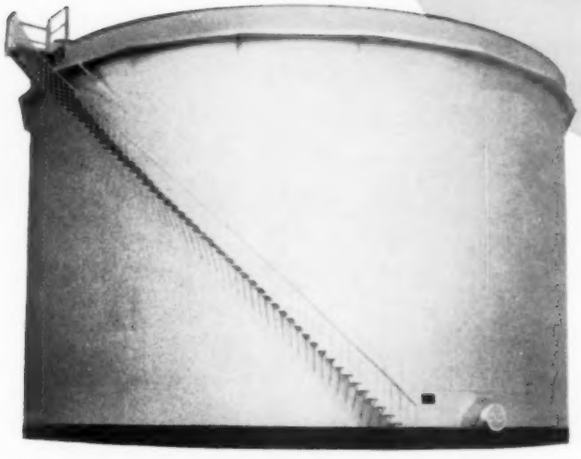
TEN MILLION

BARRELS OF OIL STORAGE *

in

VENEZUELA

. . . and many more
under construction



* *in all capacities from 1,000 to 268,000 barrels and all types including API cone roof, self-supporting roof, floating roof, spheres and stainless-clad towers, of both American and European manufacture.*

INCLUDING THE WELL-KNOWN HAMMOND TUBESEAL.

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An affiliated company of
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PINTURAS PITTSBURGH

Preferred paints in the oil industry, in Venezuela and around the world, because they last longest and protect most.

Las pinturas que prefiere la industria petrolera, tanto en Venezuela como en el mundo entero, porque protegen mas y conservan mas.

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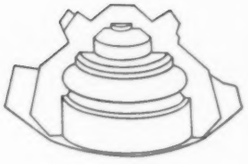
We put the MOST into

H C Smith ROCK BITS

to make them the BEST!

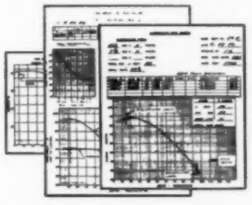


DESIGN

Thousands of hours of design engineering, based on field tests and reports, take in every detail of an H. C. Smith Bit. Tooth design—angle, thickness, shape, spacing—bearings and races, cone shape and structure, bit legs and their stress patterns . . . every part has been designed and tested for effective action on bottom and long service life.

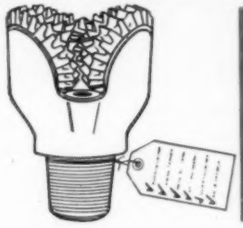
METALLURGY

The field is already familiar with the high standards of H. C. Smith metallurgy—the fact that all our steels are made to our own strict specifications; that every lot is tested by ourselves to be sure that it meets our requirements, and that our forging process is controlled to maintain maximum strength in all parts.



HEAT TREATMENT

The H. C. Smith system of heat treatment control is the most rigid and accurate in the industry. By putting standard samples of every heat of steel through our regular heat treating cycle before parts are made, the reactions of every lot are pre-determined—the hardness and carburization of every part of a Smith Bit is a known factor even before manufacture.



INSPECTION

The careful records kept on the heat treatment of every lot is only one step in the systematic inspection of all parts that go into an H. C. Smith Bit. The long service life of H. C. Smith bits in the field, reported by literally hundreds of good drillers, is the best testimony to the fact that our inspection system doesn't let a faulty bit part get out of the plant.

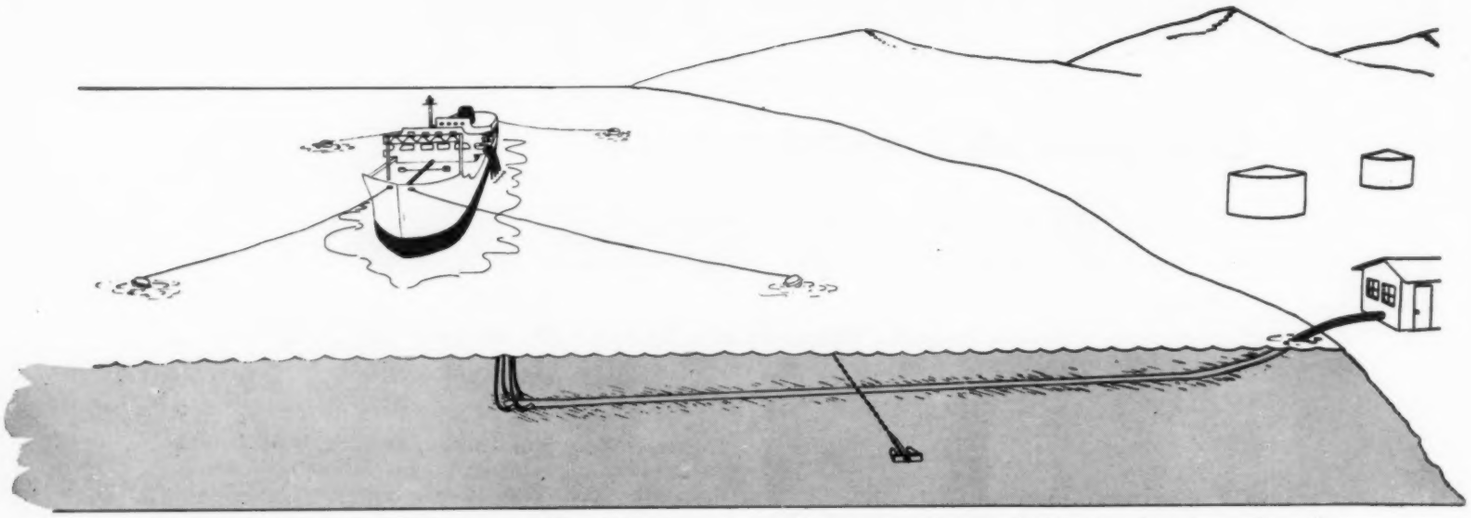
and the service your H. C. Smith man gives you is final proof that
"You'll do better with H. C. Smith Bits!"

-every bit the best

H C Smith **OIL TOOL CO.**

GENERAL OFFICES, EXPORT OFFICES AND PLANT: COMPTON, CALIF.

BRANCHES IN ALL PRINCIPAL OIL CENTERS IN THE UNITED STATES AND CANADA



Diagrammed above is a sea-loading system designed by the Collins Construction Co. All pipeline construction required for this system can be completed in less than six months under normal conditions.

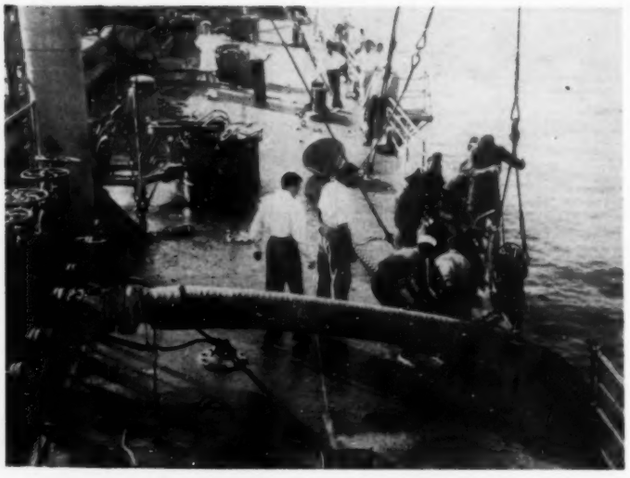
SOLVING THE SUPERTANKER PROBLEM

The most feasible solution to the harbor and anchorage problems presented by the coming 100,000 dwt supertanker lies in the utilization of sea-loading lines, terminating at depths in which any size tanker can maneuver freely under its own power.

In a fraction of the time, and at a fraction of the cost of harbor enlargement, sea-loading facilities designed to accommodate fully loaded supertankers of 100,000-ton capacity and larger can be provided in any navigable waters of the Free World.

The Collins Construction Co. has designed, engineered, and installed submarine pipelines and permanent sea-loading facilities in all parts of the world in gaining leadership in the industry. Each of these facilities has given completely trouble-free service since installation.

Employing unique installation techniques and specialized equipment, Collins has also developed a method whereby existing shallow water sea-loading lines can be extended to greater depths to keep pace with the increasing proportions of modern tankers. Extension of present sea-loading lines can be done more economically than designing and constructing completely new sea-loading systems.

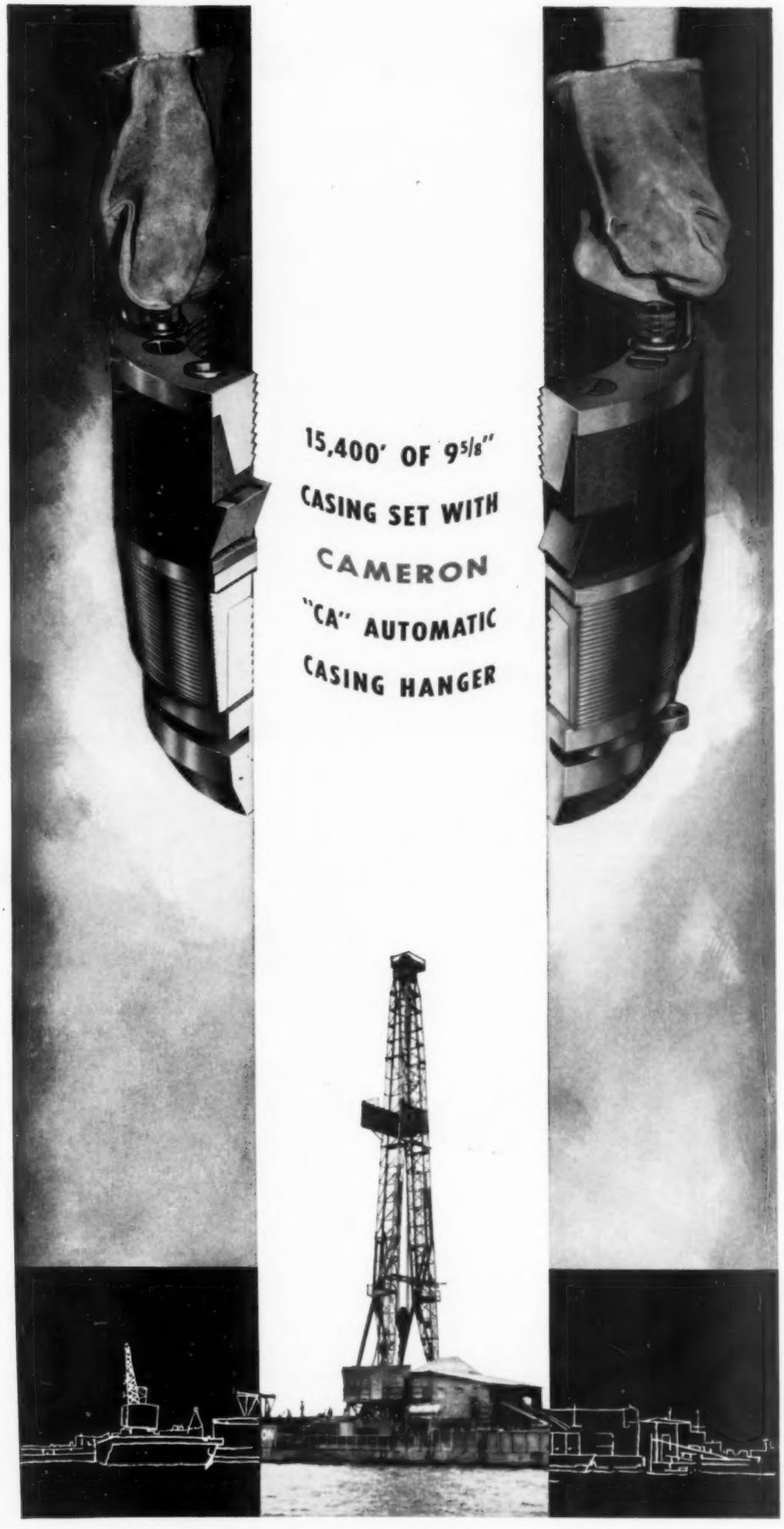


One hose already connected, another sea-loading hose is being brought on deck as the "Tagelus" of London, a T2 type 38,000 dwt tanker, prepares to begin pumping operations through a sea-loading line installed by Collins in the Bay of Bombay for the Bombay Port Trust.

Construcciones Collins de Venezuela, C.A., formed by Collins under the corporate laws of the United States of Venezuela, will give you the same excellent service and high standard work that has become the trademark of the Collins organization throughout the Free World. You may contact this company at the following address: Claude F. Horton, Hotel del Lago, Maracaibo, Venezuela, Cable Address: Coldeven Maracaibo.

COLLINS CONSTRUCTION COMPANY PORT LAVACA, TEXAS

CABLE ADDRESS - COLLINSTEX, PORTLAVACA (TEXAS)



BURTON DRILLING BARGE SETS LONGEST STRING OF CASING

At Lake Palourde in Louisiana a record string of 15,400 feet of 9⅝" N-80 46 lb. casing was successfully set with a Cameron "CA" Automatic Casing Hanger. This is only one of many extreme service installations made with the labor saving, foolproof "CA".

In 1950 Cameron started a research and development program to produce an automatic casing hanger for even greater lengths of pipe. Early in 1956 design features were finally consolidated and test records were set in Cameron's experimental lab which exceeded all expectations. Today these records are being repeated in the field. The "CA" will automatically suspend all anticipated casing lengths without "bottlenecking" at pipe loads equivalent to API joint strength—will seal highest pressures even though casing load may be extremely low. For dependable and instantaneous operation, for any load, light or heavy, at any pressure encountered today, choose the Cameron "CA" Automatic Casing Hanger.

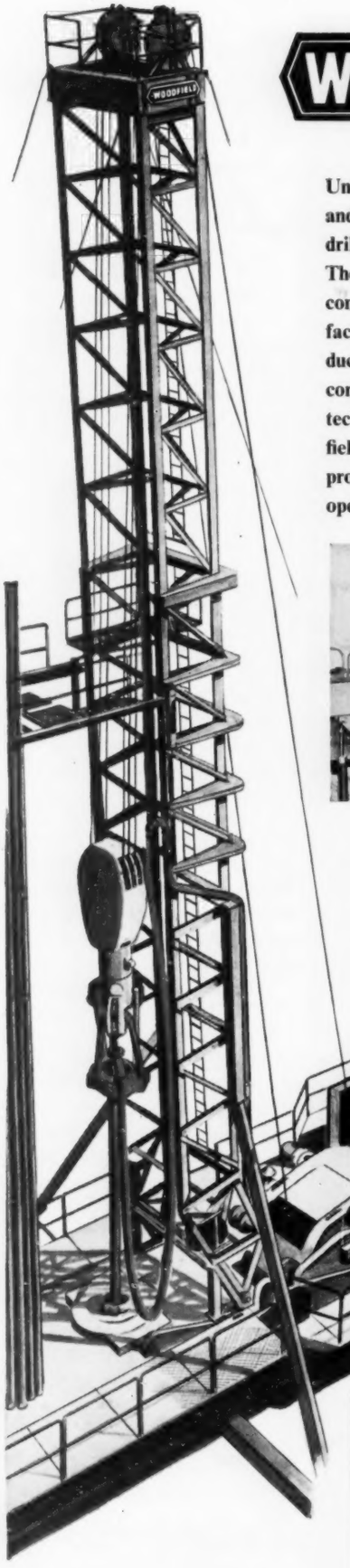
Cameron

IRON WORKS, Inc.

P. O. Box 1212 — Houston, Texas

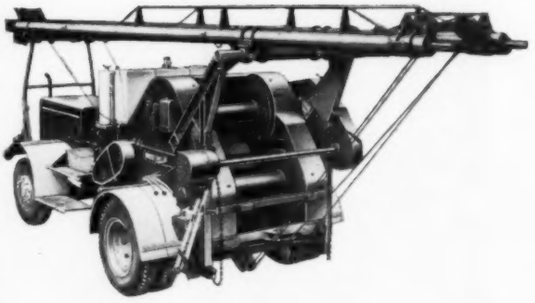
Export Office: 7912 Empire State Bldg., New York City. In England: Cameron Iron Works, Ltd., Time & Life Bldg., New Bond Street, London W. 1, England.

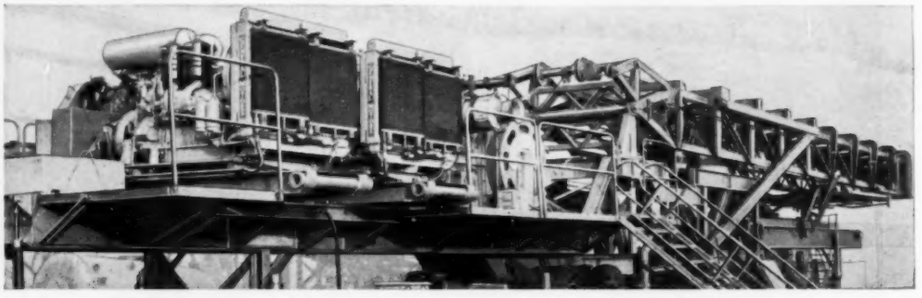
WOODFIELD OF ROCHESTER



Woodfield are licensees in the United Kingdom for the manufacture and sale of the range of I.D.E.C.O. drilling and production equipment.

The Woodfield plant at Rochester, constantly developing and enlarging its facilities, provides the means of producing first-class equipment. This, combined with frequent visits of senior technical and service personnel to fields and installations the world over, provides a service indispensable to operators requiring special equipment.



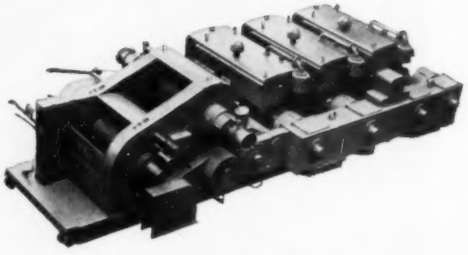


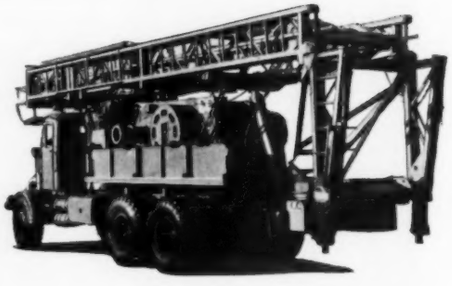
Top illustration:
Woodfield "Fieldmaster" Mobile Well Servicing and Workover Rig. Well depths up to 4,000 ft.

Centre illustration:
WOODFIELD built IDECO Hydrair H525 Dual Rambler drilling and servicing rig for wells 7,000/8,000 ft. depth. Drilling to 7,500 ft. with 4½" drill pipe.

Right illustration:
WOODFIELD built IDECO Hydrair H.40-D Double drum draw-works with 3 AEC engines, 450 H.P. and 4 shaft drive compound.

Lower right illustration:
WOODFIELD built IDECO H20 double drum Well Servicing Rig. Well depth 3,000-4,000 ft.





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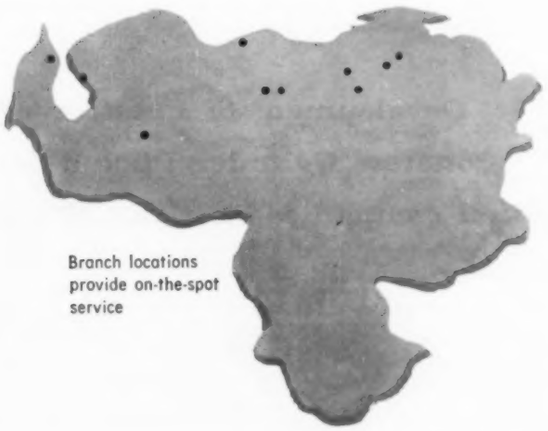


Branch locations provide on-the-spot service

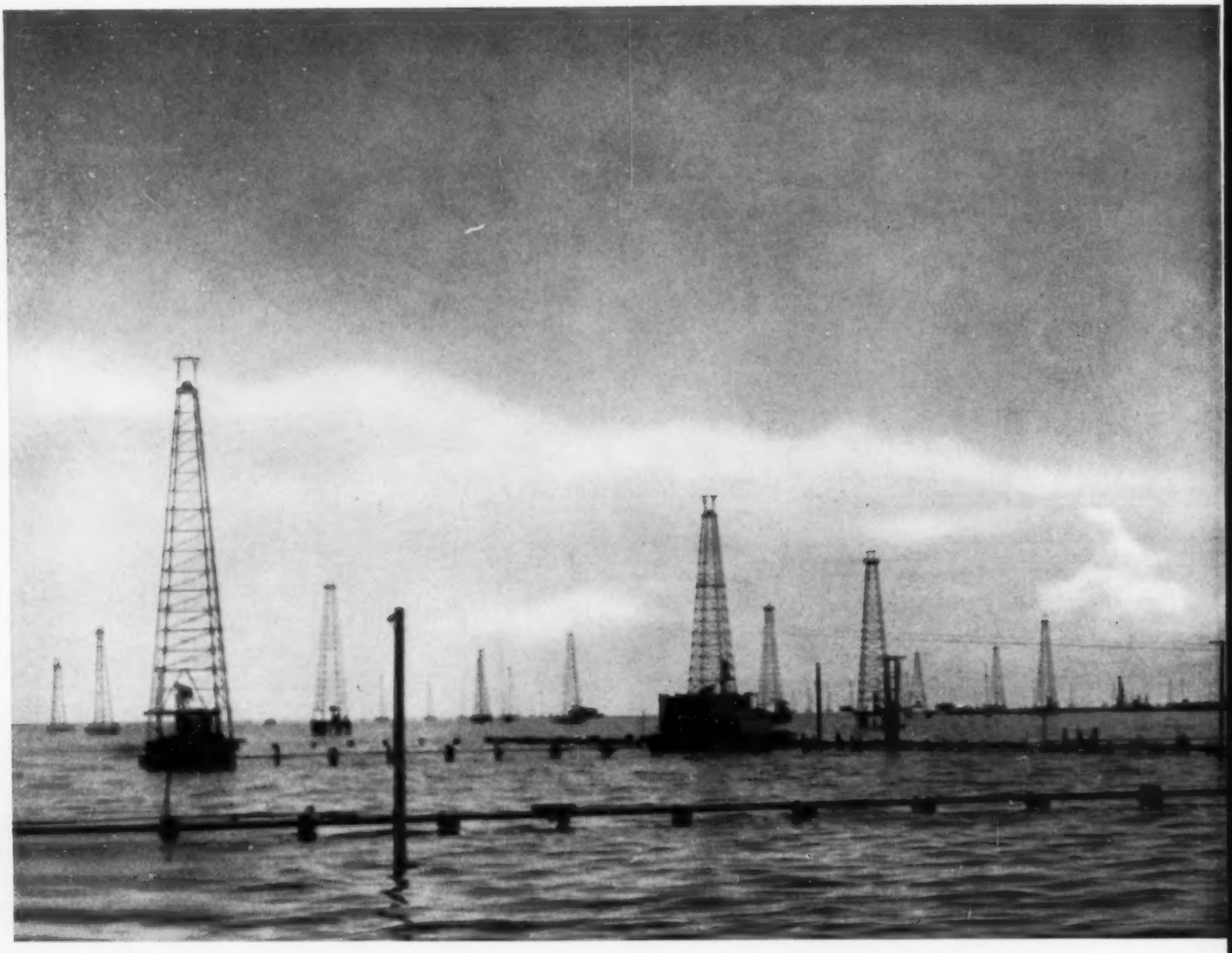
The same top-flight Lane-Wells service that operators in the U. S. know so well is available throughout the oilfields of Venezuela from Petro-Tech Service C.A. Branches are located in all active areas providing dependable, on-the-spot service that cuts your down-time to a minimum. Experienced crews—every member a thoroughly trained, skilled operator—get the job done quickly and safely to speed your completion. Of course you get the benefits of Lane-Wells' last-word equipment and the unmatched accuracy of Lane-Wells' depth measurement system—long the standard of the industry. Petro-Tech is first with the best in Venezuela.

PETRO TECH

SERVICE C.A.

Edificio Galipan • Caracas, Venezuela

PERFORATING • PACKERS • BRIDGING PLUGS • RADIOACTIVITY WELL LOGGING • OTHER WIRELINE SERVICES

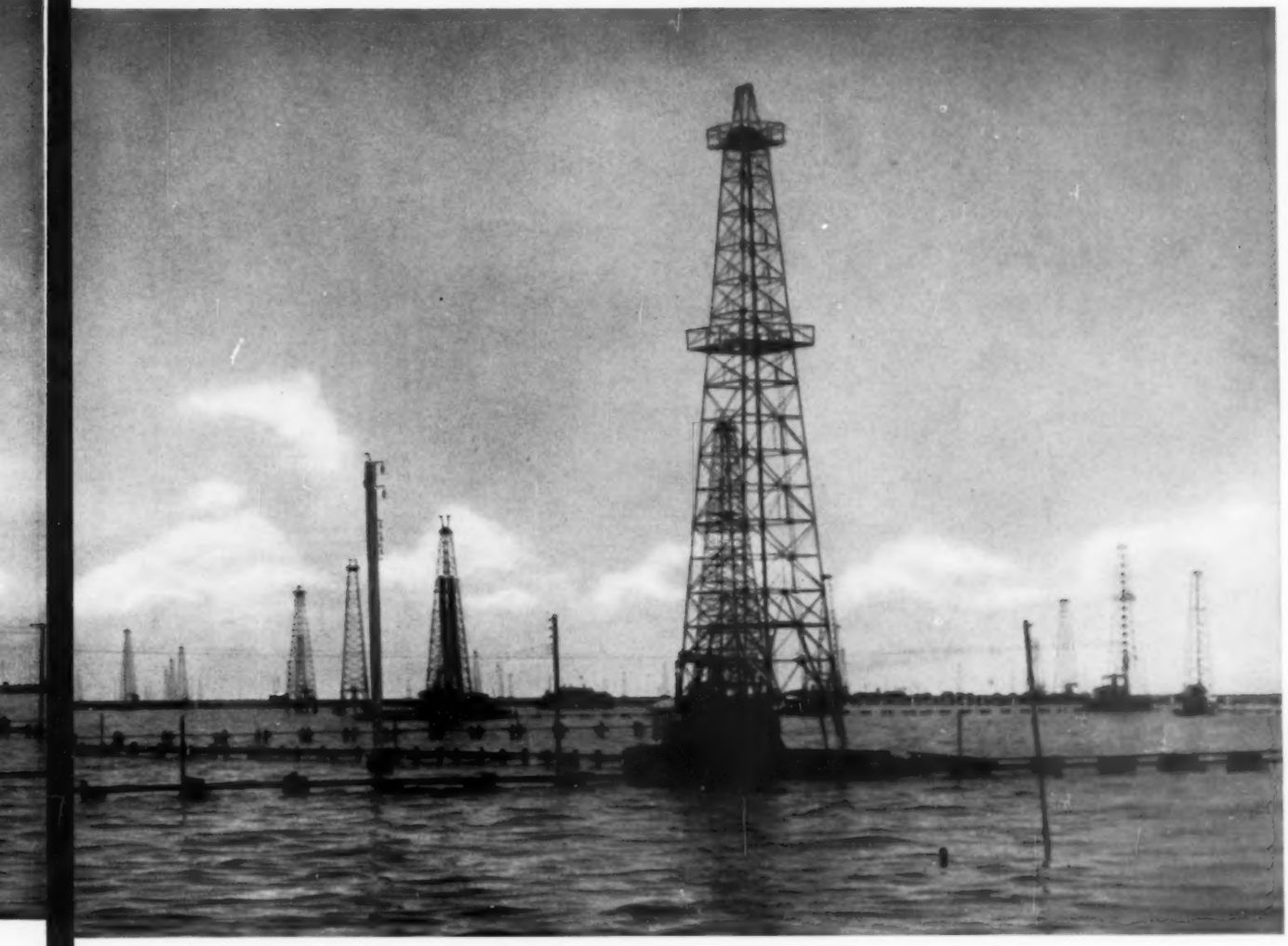


RAYMOND'S important role

Development of Prestressed Concrete Cylinder Piles a boon to oil companies on Lake Maracaibo

LEFT: Giant floating rig in action at job site.

BELOW: Pre-fabricated prestressed concrete cylinder pile en route to platform location.



in the great "Oil Rush" of '57

Not since the days of Spindle Top has the world seen such an oil boom! At Lake Maracaibo, Venezuela, offshore rigs are springing up in amazing numbers, and the swish and thump of pile drivers fill the air. At this impressive, industrious exploration and drilling site, such oil giants as Shell, Mene Grande, Signal, Superior, Sun and San Jacinto have turned to Raymond to provide derrick platform foundations. The reason: Raymond's revolutionary Prestressed Concrete Cylinder Pile. This, the latest foundation development in our 60 year history, assures complete protection against the corrosive properties of Lake Maracaibo. In addition, Raymond Cylinder Piles offer greater structural strength, increased load capacities and longer life. And, thanks to a unique assembly line process, the manufacturing of cylinder piles at the job site saves time and money.

Raymond Cylinder Piles are manufactured in a series of sections placed end-to-end, which are joined by post-tensioned cables of high tensile steel wire. The sections are then grouted to form a homogeneous, impervious support of extraordinary strength and durability. To meet the demands of the new contracts, we are expanding our cylinder pile manufacturing yard, which is located right at the job site. When completed, this yard will be the largest of its type in the world!

For over 50 years, Raymond has served the oil industry, and since 1926, we have maintained a permanent office in Venezuela. You will find Raymond foundations supporting offshore drilling rigs, tanker wharves, cat-crackers and storage tanks just about everywhere oil is drilled and refined. May we also serve you?

FOUNDATIONS FOR THE STRUCTURES OF AMERICA... COMPLETE CONSTRUCTION SERVICES ABROAD

RAYMOND Concrete Pile Co.

140 CEDAR STREET, NEW YORK 6, N. Y.

Branch Offices in Principal Cities of the United States. Subsidiaries in Canada, Latin America and other countries.

OUR 60th YEAR

A 6 x 6 Scammell "CONSTRUCTOR" oilfield motive unit with semi-trailer, one of the many operating in Kuwait and other major oilfields of the world.

A triumph of individual craftsmanship

Purpose-built by SCAMMELL for oilfield operation

Mass production doesn't enter into Scammell's scheme of things. Individual design and construction is the hall mark which proves the solid worth of Scammell transport—transport that is purpose-built to fulfil in every detail the requirements of the operator.

Tackling with ease the most punishing conditions . . . providing maximum economy in operating costs . . . working day in and day out for year after year, Scammells are doing a grand job in the oilfields throughout the world.

Scammell, from a range of transport varying between 3 tons and 150 tons, can supply all-wheel drive oilfield bed-trucks and motive units; tankers; chassis for well-servicing hoists, drill rigs, cement mixers, etc.

They will be pleased to quote for all types of trucks and trailers built to your specification.

A 4 x 4 Scammel "MOUNTAINEER" 17 ft. wheelbase 1,500 gallons capacity water tanker operating in the Middle East.

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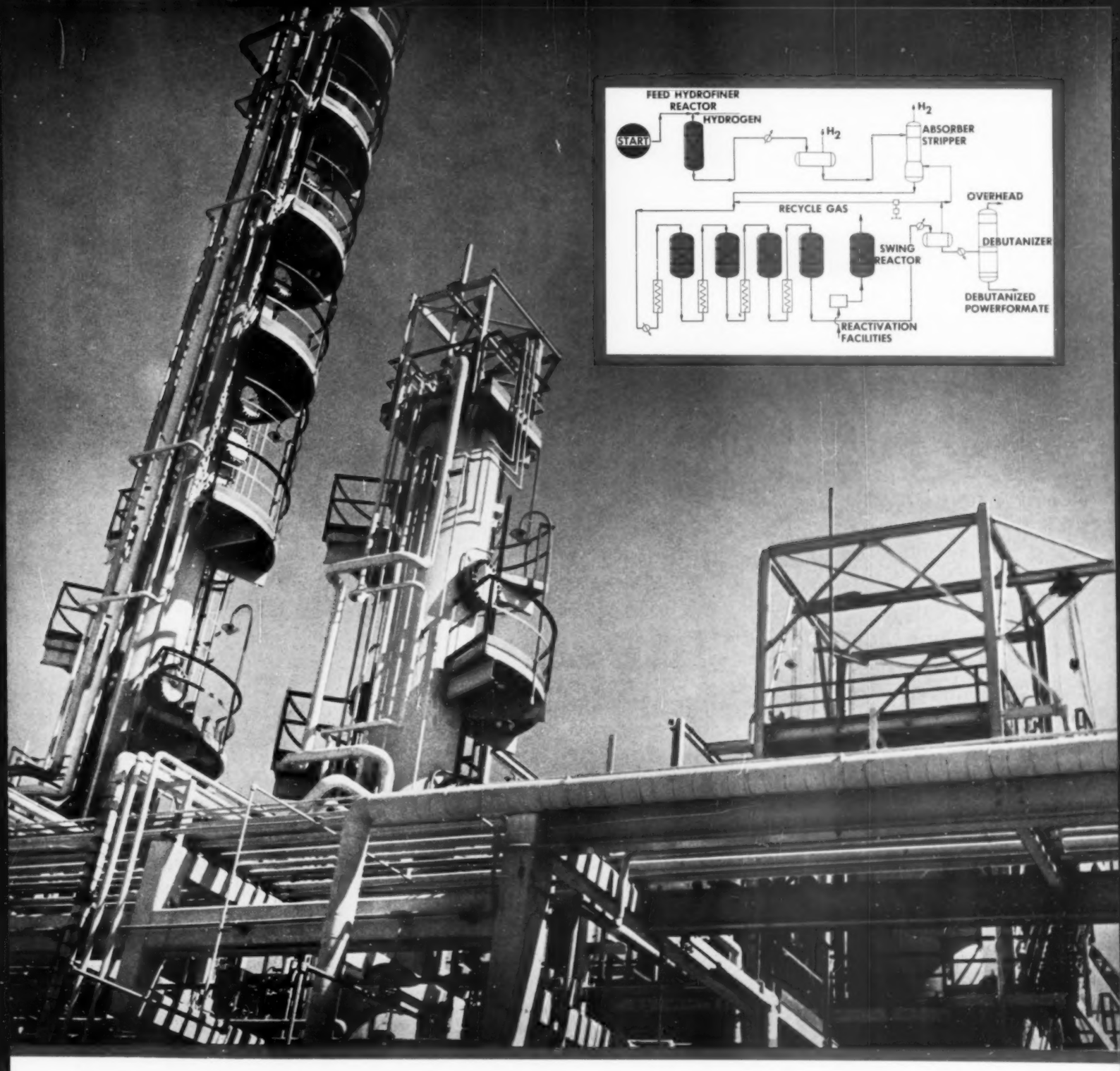

POWERFORMING PROCESS CAN INCREASE YOUR HIGH OCTANE YIELD

Esso Research and Engineering Company offers you *Powerforming*, the most versatile platinum reforming process ever developed. *Powerforming* is another achievement of the Esso Research program—37 years of new process developments which have been made available to refiners around the world.

Heart of the *Powerforming* process is a new, more active platinum catalyst. High activity over a long life is assured by significant new regenerative techniques. With this new process, good yields of 100 octane clear Powerformate can even be obtained from paraffinic stocks. Three *Powerforming* installations are on stream; eighteen are in the planning or construction stage. Licensees enjoy benefits of continuing *Powerforming* research. We would welcome your inquiry on the part *Powerforming* can play in *your* modernization plans.

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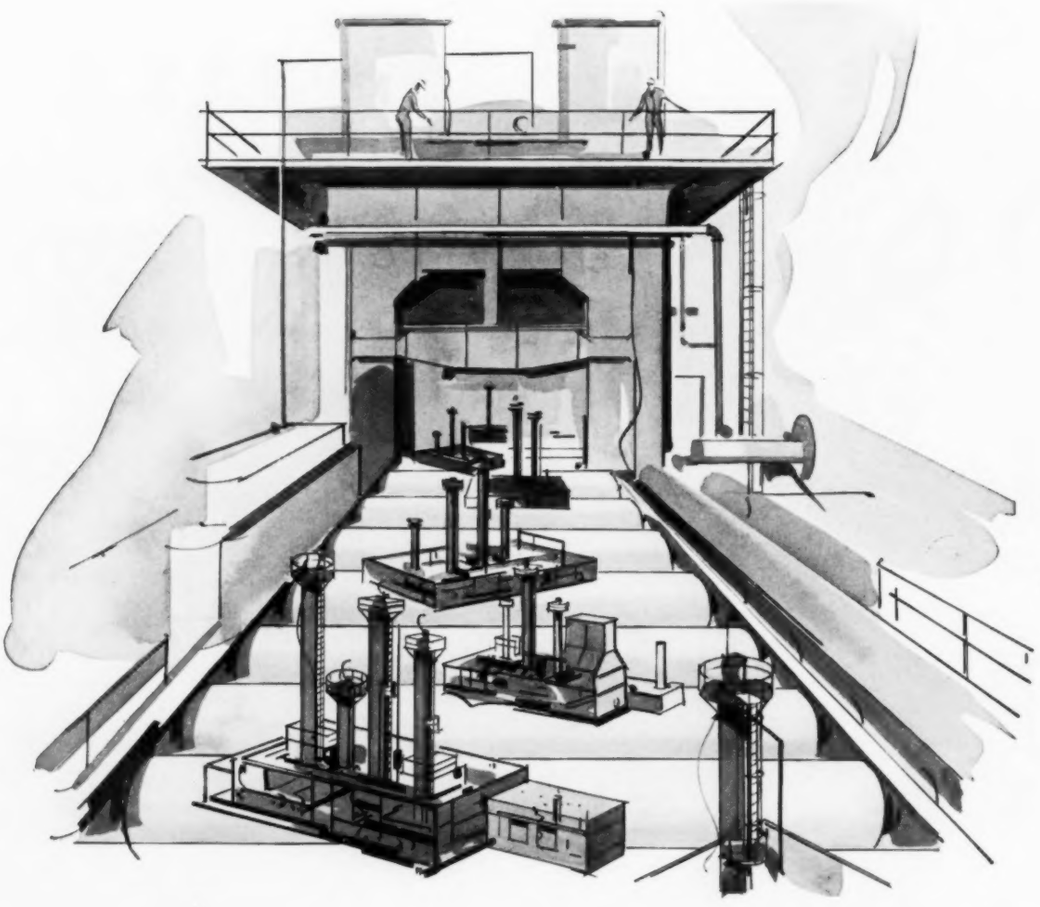
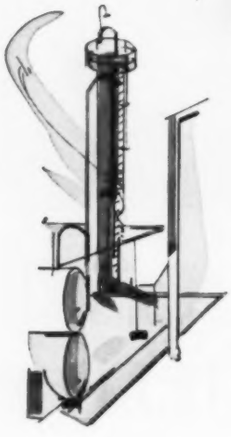
Your key to progress... an Esso Research process



There's no production line for plant construction



There's nothing routine about this business of building petroleum refineries, chemical plants, and petrochemical plants. Every construction project is a different problem, a fresh challenge, an opportunity for new accomplishments. That's why we've assembled here at Procon an engineering and construction staff with the broad experience, the technical know-how, and the creative enthusiasm to meet and master any construction problem to your better-than-ordinary satisfaction. If you are in a building mood, Procon can help you!

PROCON *Incorporated*

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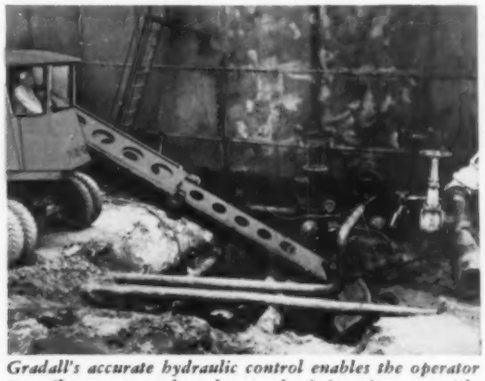
Gradall handles all types of excavation. This machine speedily digs a trench for a pipe line at a West Coast refinery.

Leading Refineries rely on **Gradall** to cut costs on both construction and maintenance

Gradall positions and holds pipe in place while welders tack-weld new pipe run at a leading Eastern refinery.

Gradall covers 3000 sq. yards of dyke with a 3-inch layer of slag in only 8 hours at an Esso Standard Oil, New Jersey refinery.



Gradall's accurate hydraulic control enables the operator to easily uncover and work around existing pipe runs without danger of damage to the pipe at a Sun Oil Co. refinery.

Two Gradalls finish grade a new firewall at the Sun Oil Co., Marcus Hook, Pennsylvania refinery. Note the clean job completed without hand labor.

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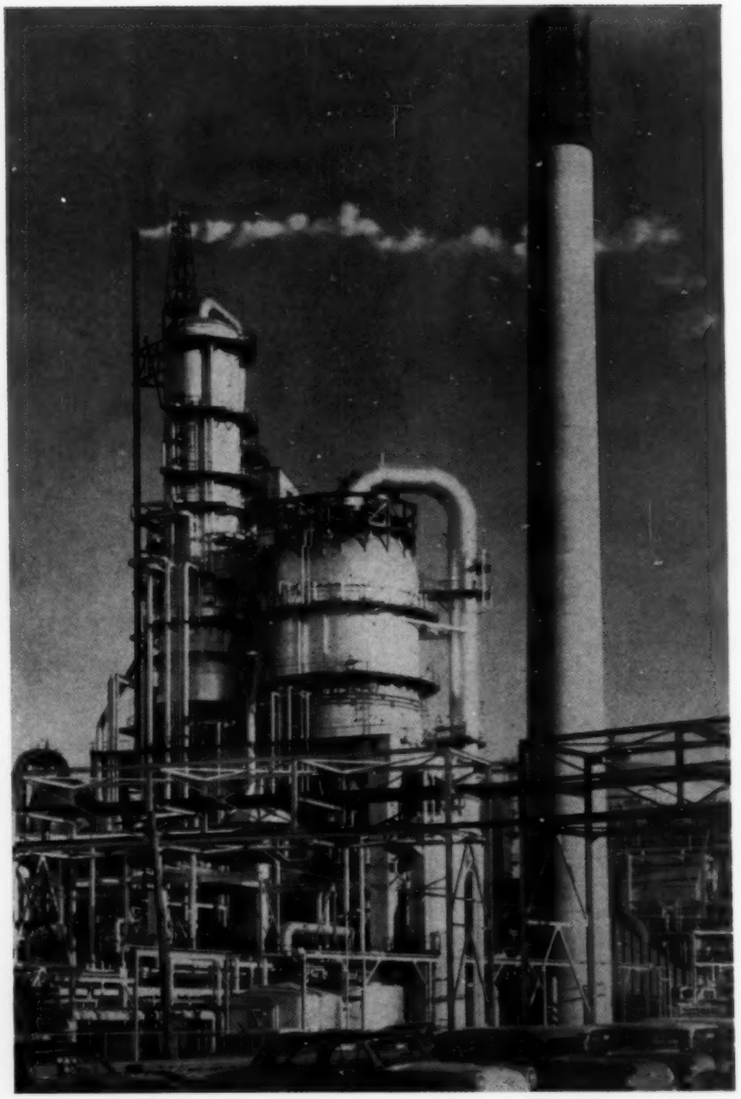
The Mexico Refractories Company manufactures a custom-built Castable for most every refractory application in the Oil and Chemical fields — fields in which Mex-R-Co has specialized for years.

Typical Mex-R-Co products, the result of these years of experience in specialization, are the two Refractory Castable products used in lining this mammoth vessel — HI-STRENGTH F-303-S and I-R-C 20-G.

Yes, experience counts! But, Quality Raw Materials PLUS Controlled Manufacture PLUS Application Know-How are what makes the big difference in Mex-R-Co "Better Refractories" products.



World's largest fluid coking plant recently built at Tidewater Oil Company's Avon Flying-A Refinery at Associated, California.

Engineers - Constructors: Bechtel Corporation
Castable Installation: J. T. Thorpe & Son, Inc.

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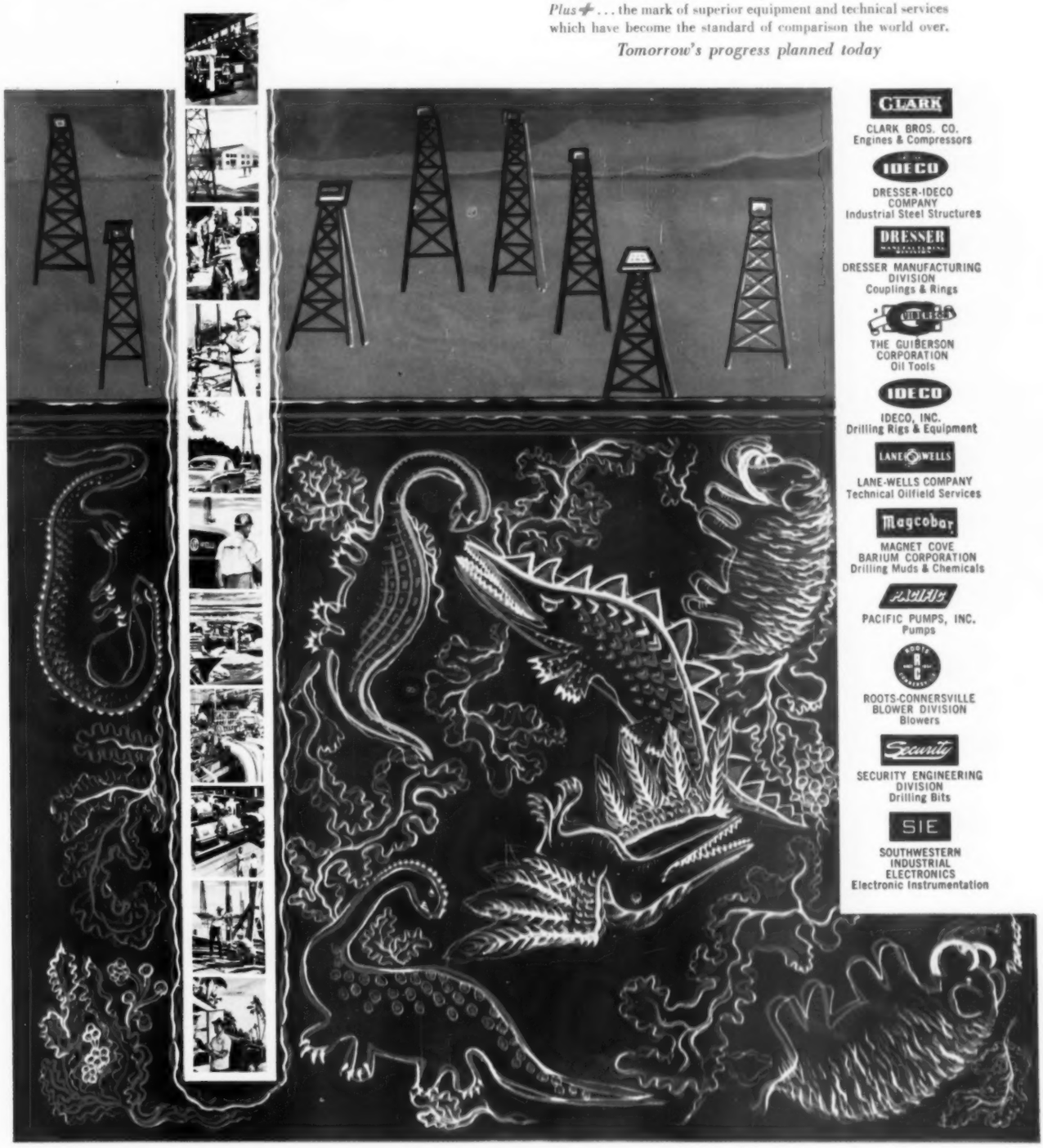
Whatever your needs, specify equipment from Dresser companies. No other single organization offers you the same broad range of experience coupled with individual company attention to these specific needs. Be sure to look for the symbol that identifies the Dresser companies. It's your guarantee of the Dresser *Plus* +... the mark of superior equipment and technical services which have become the standard of comparison the world over.

Tomorrow's progress planned today



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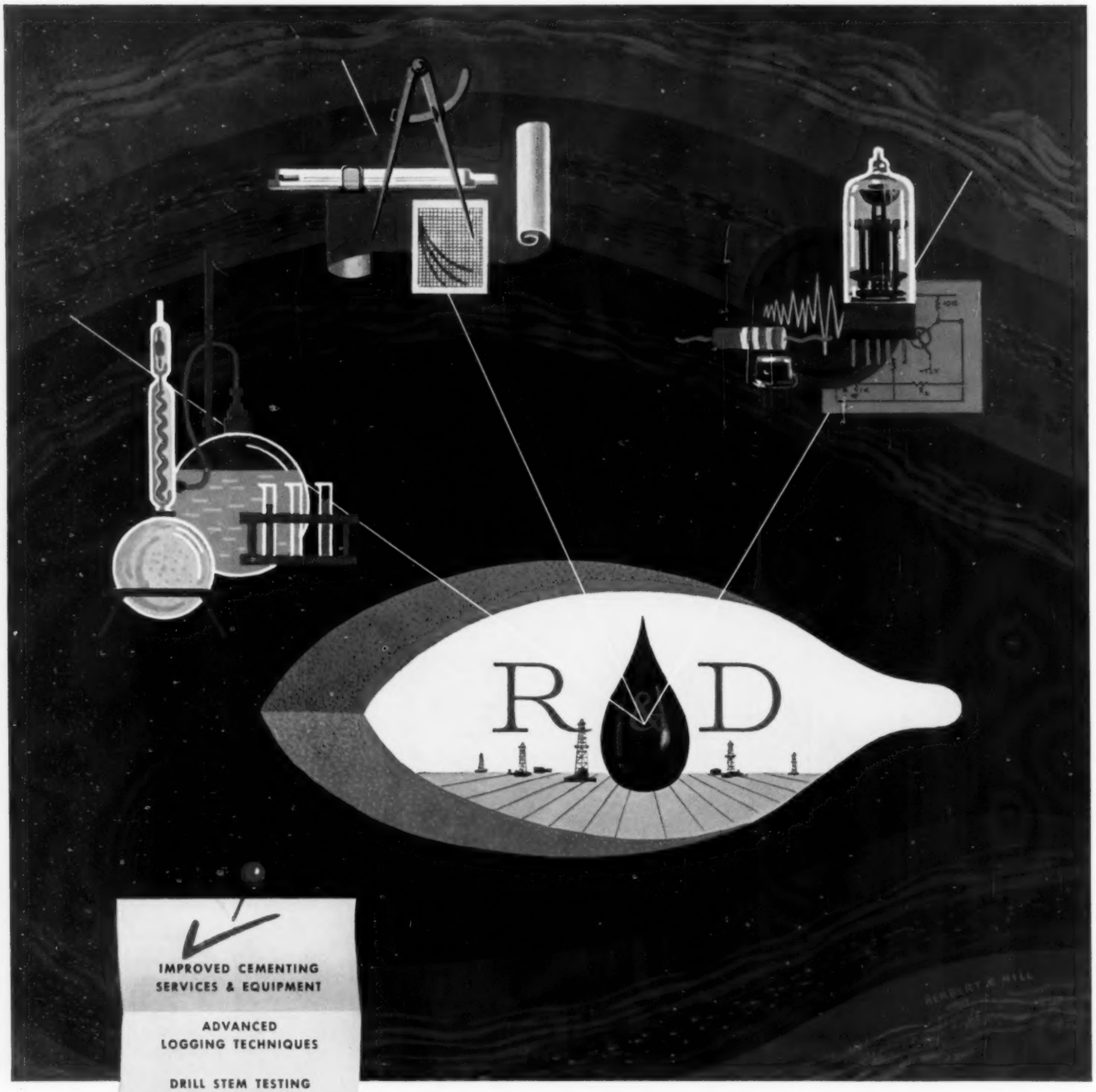


HALLIBURTON RESEARCH and DEVELOPMENT:

Pace-Setter for Production Improvement

Behind all the complexities of modern petroleum technology lies science, the research and development necessary to convert the basic laws of nature into the benefits of man.

Oilmen continue to look to Halliburton Research and Development for new ways to discover unknown pay zones and still better ways to improve present production.

Customer needs + (R & D) + Field Application = Bonus Barrels

HALLIBURTON OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

Mid-Continent Supply Co., photo

Dedication

As one of the world's three great sources of oil energy, Venezuela has contributed enormously to the free world's development and protection. In 20 years Venezuelan oil production has risen eight-fold and through wise investment of oil revenues a diversified major modern state is emerging with bright prospects for the future.

Vital to this development has been confidence in Venezuela's integrity and ability. Certain key oil administrators within the government built this structure of trust, combining unswerving loyalty to their country with vital practical knowledge and sympathy for the oil industry's problems. This issue is respectfully dedicated to them, the far-seeing members of the Ministry of Mines and Hydrocarbons who, under the wise guidance of their President, have made Venezuela's development possible.

Dedicación

Como una de las tres grandes fuentes mundiales de hidrocarburos, Venezuela ha contribuído inmensamente al desarrollo y protección del mundo libre. En 20 años, la producción de petróleo en Venezuela ascendió a ocho veces la cifra anterior y, a través de la juiciosa inversión de las rentas del petróleo, está surgiendo un gran estado diversificado moderno con halagadoras perspectivas para el futuro.

De importancia vital para este desarrollo ha sido la confianza en la integridad y habilidad de Venezuela. Ciertos destacados directores petroleros dentro del gobierno levantaron esta estructura de confianza, combinando su inalterable lealtad a su gobierno con sus conocimientos prácticos y reconocimiento de los problemas de la industria petrolera. Esta edición va respetuosamente dedicada a ellos, los miembros previsores del Ministerio de Minas e Hidcrocarburos quienes, bajo la sabia dirección de su Presidente, han hecho posible el desarrollo de Venezuela.

EL PRESIDENTE DE LA REPUBLICA
DE VENEZUELA

El desarrollo de la industria petrolera venezolana es el resultado de la acción conjugada del Estado y del capital privado.

La producción en 1956 alcanzó un promedio diario de 2.456.785 barriles de crudo.

Al finalizar el año de 1956 se contaba con reservas de 14 mil millones de barriles de petróleo y de 26 mil billones de pies cúbicos de gas.

Dentro de una política de adhesión de Venezuela al sistema de libre empresa y del propósito de obtener los mayores beneficios de la riqueza petrolera para invertirlos juiciosamente en favor del progreso de la Nación, el Gobierno resolvió otorgar nuevas concesiones mediante el sistema de licitación.

El otorgamiento de concesiones en 1956 fué de 190.000 hectáreas de exploración y 111.713 hectáreas de explotación. En el lago de Maracaibo se obtuvo, por hectárea, un promedio de Bs. 6.479,61 por impuesto inicial de explotación, que es el más alto registrado en el mundo.

La superficie afectada por concesiones se eleva en la actualidad a 6.171.679 hectáreas.

Caracas, mayo de 1957

Marcos Pérez Jiménez

The development of the Venezuelan petroleum industry is the result of joint action by the State and private capital.

Production in 1956 reached a daily average of 2,456,785 barrels of crude oil.

At the end of 1956 reserves amounted to 14 billion barrels of petroleum and 26 trillion cubic feet of gas.

Based on its belief in the system of free enterprise and its policy of obtaining maximum benefits from its oil wealth in order to invest them wisely for the nation's progress, the government decided to grant new concessions under a system of bidding.

Concessions granted in 1956 totaled 469,490 acres for exploration and 276,043 acres for exploitation. In Lake Maracaibo the initial exploitation levy averaged $1,098 per acre, the highest in the world.

Total area under concession at present has risen to 15,250,713 acres.

(Translation)

CONSERVACION MAXIMA

Y Clima Ideal De La Libre Empresa

DECIR que la Conservación representa uno de los grandes objetivos de la Industria Petrolera Venezolana es quedarnos cortos en la expresión. Con ello se daría la falsa impresión de que el de la Conservación es un problema que comparte un alto sitio con otros problemas petroleros de igual jerarquía. Y no es así. Lo cierto es que en Venezuela todos los caminos de la acción oficial se dirigen, ascendiendo, hacia la Conservación y en ella convergen: la Conservación está sola en sitio preeminente. Dirección y meta, pues, de los esfuerzos del Gobierno en materia de hidrocarburos, ella es capaz, por sí sola, de resumir la esencia de la política petrolera venezolana.

Conviene advertir, para la cabal comprensión de esta afirmación, que el instrumento conceptual, el termino conservación, no sólo ha adquirido, gracias a un análisis cada vez más exigente y penetrante, su máxima forma y alcance, sino que, celda immensa, se ha llenado de contenido dinámico, gracias a la filosofía de acción del Gobierno. Así podemos decir, no sólo que reinyectamos gas natural para conservar, que es lo común, sino que, para conservar, otorgamos concesiones, exploramos y explotamos, que es lo extraordinario. En otras palabras, nos enfrentamos, conscientes, a la paradoja de aprovechar, mediante una producción gradualmente creciente, según las exigencias del mercado y la capacidad de absorción de rentas del propio país, las reservas de un precioso recurso natural agotable, no para disminuir sino para aumentar, precisamente, al final de cada ejercicio, tales reservas.

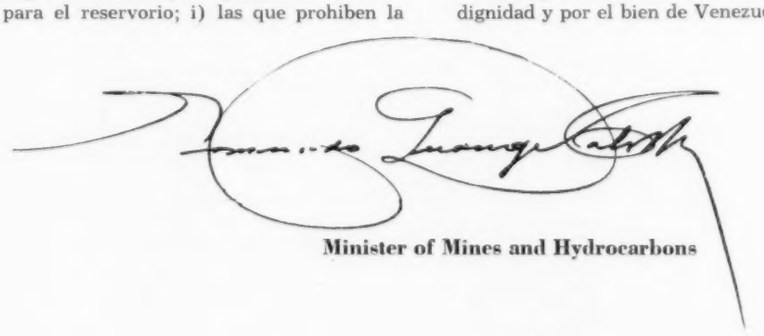
La libre empresa, cauce único que ha tenido para desarrollarse a Industria Petrolera Venezolana y que por tanto representa con propiedad su cauce histórico, permite a las empresas operadoras, y más aún les exige, el aprovechamiento máximo de los hidrocarburos, del gas natural especialmente, en las operaciones inherentes a la explotación. Todos los volúmenes que ellas, técnica o económicamente, no puedan utilizar, serán salvados por el Gobierno de su fatal disipación en la atmósfera, al tomarlos para alimentar la red de gasductos nacionales o para servir de materia prima en la Petroquímica, obras concebidas con la noble finalidad de coadyuvar a la satisfacción integral de la tesis del Gobierno de transformar el medio físico y elevar más aún el nivel de vida de los habitantes del país. Como corolarios maduros, se desprenden, pues, de la Industria Petrolera Venezolana dichas obras, sin menoscabar en absoluto la plenitud de la libertad de empresa en que aquélla se desenvuelve; y, analizadas a fondo, ambas representan manifestaciones netas de alta Conservación.

Nos esforzamos para ser trascendentes, diáfanos, didácticos, cuando queremos mostrar en nuestras manos el valioso hallazgo de algo que pudo ser viejo en el mundo y dolorosamente no lo fue, de algo que en Venezuela ha adquirido mayor campo focal y mayor empuje que en ninguna otra parte: la Conservación. Se nos antoja decir que así como a fuerze de estudiarse bien un bello cuadro, las sombras, que aparentemente son lo secundario, algunas veces encarnan todo el mérito de la obra pictórica, así las sombras, antes despreciadas, del cuadro de la industria, han logrado representar el mayor mérito económico y la mayor fuerza vital de la misma. En efecto, no cuentan tanto para Venezuela las reservas comprobadas de 14 billones de barriles de petróleo como las de 26 mil billones de pies cúbicos de gas, no simplemente por la abrumadora magnitud de éstas, sino por el sentido nuevo que adquiern cada dia a la luz de la diversificación industrial que el avance de la técnica general está provocando.

En el campo específico de la explotación el Gobierno mantiene en vigor un conjunto de reglas de obligatorio cumplimiento, entre las cuales cabe señalar: a) las relativas a la determinación precisa de los métodos de producción que más convengan a cada criadero; b) las de determinación de las ratas adecuadas de producción e inyección de los flúidos; c) las necesarias para el establecimiento de las rigurosas relaciones del gas, o del agua, con el petróleo y del potencial con la producción efectiva; d) las concurrentes al mantenimiento de la presión del reservorio; e) las que establecen el debido espaciamiento entre los pozos; f) las que tienen por finalidad exigir la instalación de plantas de inyección y de tratemiento de gas; g) las que tienen por norte establecer la explotación unificada; h) las que inexorablemente conducen al cierre de los pozos mal ubicados en la estructura o cuya relación de gas a petróleo sea dañina para el reservorio; i) las que prohiben la explotación de las reservas de condensado mientras no se compruebe una utilización satisfactoria, para el Gobierno, del gas de la formación; j) las que exigen un aprovechamiento racional del gas en las operaciones de explotación, y k) las que buscan el establecimiento de un volumen de compensación técnica entre el potencial y la producción.

Durante los últimos cinco años, incluídos los primeros 5 meses de 1957, solamente el esfuerzo aplicado a la inyección de gas ha dado como saldo el establecimiento de plantas con capacidad conjunta de inyección de 895 millones de pies cúbicos por dia, lo que garantiza una recuperación adicional (secundaria) de 726 millones de barriles de petróleo. Dentro de este campo merecen ser destacadas las plantas No. 1 (LL-370), No. 2 (LL-453) y No. 3 (TJ-102), con capacidades diarias respectivas de 129, 315 y 300 millones de pies cúbicos, por tres razones: 1) porque todas han sido erigidas por una misma empresa concesionaria, la Creole Petroleum Corporation; 2) porque todas están ubicadas en una misma importante zona petrolera del país, el Lago de Maracaibo, y 3) porque cada una de ellas puede compararse con la mayor planta que haya sido establecida en cualquier parte del mundo en un yacimiento individual.

Si la Conservación es el puerto luminoso hacia el cual se orienta la marcha de la Industria Petrolera Venezolana, el tratamiento de alta consideración y de respeto que recíprocamente se aplican entre sí los dos elementos activos que la integran, el Gobierno y las Compañías, constituye el clima ideal para su óptima prosperidad. Nos hacemos eco del decir de muchas personas autorizadas al afirmar ahora que, en el sentido de la sinceridad y claridad de las relaciones de ambas partes, Venezuela ofrece un ejemplo singular en el mundo. No sólo se cuenta en el país con los lineamientos teóricos que pueden servir de base general a un entendimiento mutuo, sino que existe la disposición efectiva de lograr ese entendimiento todos los días, con la única condición obligatoria de hacerlo con la máxima dignidad y por el bien de Venezuela. END



Minister of Mines and Hydrocarbons

Venezuela: MAXIMUM CONSERVATION

and an Ideal Climate for Free Enterprise

It is an understatement to say that one of the main objectives of the Venezuelan oil industry is conservation. That would tend to leave the mistaken impression that the problem of conservation is on a par with other oil problems of the same category, and such is not the case. The fact is that in Venezuela all official policies are aimed at and concentrated upon the problem of conservation, which stands alone above all others. As the goal, therefore, of all the government's efforts in the field of hydrocarbons, it embodies the very essence of Venezuelan oil policy.

It should be realized, if this statement is to be properly understood, that the concept itself, the term "conservation," has not only achieved, thanks to ever more exacting and penetrating analysis, its maximum form and range, but that, like in an immense vault, it has been filled up with dynamic power, thanks to the philosophy behind the government's policy. Thus we can say, not only that we return natural gas to its source with a view to conservation, which is normal practice, but that, also for purposes of conservation, we grant concessions, explore and exploit, which is unusual. In other words, we consciously face up to the apparent paradox of utilizing, by means of gradually increasing production, attuned to the requirements of the market and the country's own capacity to absorb wealth, the reserves of a precious but not inexhaustible natural resource, but in such a way as not to diminish, but rather increase, those reserves, at the end of each fiscal year.

The system of free enterprise, the only system under which the Venezuelan oil industry has developed and which can therefore be properly described as its historical background, allows, and even demands of the operating companies the fullest possible utilization of the hydrocarbons, especially natural gas, in the essential processes of exploitation. All quantities of these materials which, for technical or economic reasons, they cannot utilize, will be saved by the government from their fatal dispersion in the atmosphere, and used to supply the national network of gas lines or serve as raw materials for petrochemical plants—all these works having been conceived as part of the noble plan of the government of transforming the physical environment of the people and raising their standard of living even higher. These projects stem, therefore, as a natural consequence, from the oil industry, without in any way interfering with the complete freedom of enterprise which prevails therein; and, in the last analysis both things represent an enlightened policy of conservation.

We have tried to present in a clear and logical manner the valuable discovery of a principle which should always have been applied throughout the world, but unfortunately was not, and which has assumed far greater importance and significance in Venezuela than anywhere else: the principle of conservation. When we carefully study a beautiful picture we sometimes find that it is really the shadows, apparently of secondary importance, which embody the whole merit of the work, and, in the same way, we might say that it is the formerly despised shadows in the overall picture of the industry which have come to represent its greatest economic potential and its most vital resources. In effect, Venezuela does not value its known reserves of 1.4 billion barrels of petroleum as highly as those of 26 thousand billion cubic feet of gas, not merely because of the vast volume of the latter, but because of the new significance they acquire from day to day in the light of the industrial diversification which is being brought about by the general progress of technology.

In the specific field of exploitation, the government maintains in effect a body of regulations which are strictly enforced and among which the following are worthy of note: a) those which refer to the precise determination of the production methods most expedient in the case of each deposit; b) those which refer to the determination of the proper rates of production and of injection of fluids; c) those necessary to establish the strict relationship between the gas, or water, and the oil and between potencial and actual production; d) those which contribute to the maintenance of reservoir pressure; e) those which fix the correct space between the wells; f) those whose purpose is to encourage installation of gas injection and treating equipment; g) those concerned with the establishment of unified exploitation; h) those which inexorably lead to the closing down of wells improperly located in relation to the oil-bearing structure or whose gas-oil ratio may be detrimental to the deposit; i) those which forbid the exploitation of condensate reserves until such time as it has been possible to establish a use satisfactory to the government for the gas from the formation; j) those which require a rational utilization of the gas in the exploitation process, and k) those which aim at the establishment of a technical equilibrium between the potential and actual volumes of production.

During the past five years, including the first 5 months of 1957, the efforts applied to gas pressuring alone have resulted in the installation of plants with a joint pressuring capacity of 895 million cubic feet per day, which guarantees an additional (secondary) recovery of 726 million barrels of petroleum. Worthy of note in this connection are the plants No. 1 (LL-370), No. 2 (LL-453) and No. 3 (TJ-102), with respective daily capacities of 129, 315 and 300 million cubic feet. They are of interest for three reasons: 1) because all were constructed by the same concessionary company, the Creole Petroleum Corporation; 2) because all are located in the same important oil-bearing region of the nation, the Lake of Maracaibo, and 3) because each of them can be compared with the largest plant installed anywhere in the world on a single deposit.

If conservation is the shining goal towards which the Venezuelan oil industry strives, the mutual consideration and respect which prevail between the two active elements of which it is composed, the government and the companies, provide the ideal climate for its maximum prosperity. We are echoing the words of many authorized persons when we now declare that, insofar as concerns the sincerity and fairness which characterize the relations between these two parties, Venezuela offers an example unique in the world. This country not only has the theoretical plans which might serve as a general basis for a mutual understanding, but also the firm determination to achieve such an understanding in all cases, with the sole and inflexible condition that it is done with all dignity and to the welfare of Venezuela.

END

VENEZUELA

Un Pais en Marcha

DR. SILVIO GUTIERREZ
Ministro de Fomento

Los índices de exportación de sus productos vitales, su comercio exterior e interior, la diversificación de sus industrias, el amplio Plan de Electrificación que se lleva a cabo, la tecnificación de los medios de producción, el incremento de la capacidad adquisitiva, la planificación y tecnificación de los organismos encargados de supervigilar el desarrollo de la industria nacional, hacen de Venezuela un país en marcha hasta el punto de que en cinco renglones vitales de la producción ocupa el primer puesto entre los países del Continente Americano.

Los Planes de ejecución y los estudios que se llevan a cabo, revelan incuestionablemente el porvenir económico de este importante país de la America del Sur que tanto renombre tiene en el campo económico internacional.

Cuando se iniciaron los trabajos para aprovechar el potencial hidroeléctrico del Río Caroní, se pensó con seriedad en la influencia de la electrificación en el desarrollo de la Guayana venezolana y en la Economía general del país.

Los recursos naturales concentrados en la zona de Guayana, son tan extraordinarios que su utilización progresiva y constante iniciará un desarrollo intenso en esa parte del país. Tanto es así que a ambos lados del Caroní se explotan minas de hierro con grandes reservas. La existencia de minerales de manganeso, aluminio y de otros elementos de importancia industrial, también han sido comprobados. Todo esto, unido a la cercanía de los yacimientos petroleros del oriente de la República, y de las mayores reservas de gas del país, justifican, así como también la instalación de la industria siderúrgica nacional, la inversión que el Gobierno venezolano viene llevando a cabo en la zona del Caroní para convertir en riqueza hidroeléctrica el caudal de su Río. Para ello, se ha delimitado una zona potencialmente productora, de enorme capacidad, dentro de un radio de 300 Km. a contar de San Félix la cual será beneficiada con la instalación de la primera Central hidroeléctrica.

Dos etapas comprenden los trabajos de electrificación del Caroní:

PRIMERA ETAPA DE LOS TRABAJOS

Aprovechamiento inmediato (en construcción)

Macagua 1: Primer semestre de 1958, 50,000 kw.
Primer semestre de 1959, 200,000 kw.

Costo: 120.000.000,oo de bolívares (o sea Bs. –600,oo por kilovatio instalado aprox.)

SEGUNDA ETAPA DE LOS TRABAJOS

Aprovechamiento futuro a corto plazo

La segunda fase del proyecto comprende la construcción de las grandes presas, que permitirían la regulación del régimen hidráulico del rio. La presas y los embalses correlativos habrán de constiuír obras de primera magnitud en escala mundial.

La finalidad de la obra corre pareja con la utilización de la energía eléctrica proveniente del Río Caroní para contribuír a industrializar en gran escala la zona de la Guayana, incorporando sus ingentes recursos a la Economía-Nacional.

Después del Orinoco el Caroní ocupa el segundo lugar entre los ríos del país. Su potencial hidroeléctrico es el más im-

Venezuela . . . .

ON THE MOVE

DR. SILVIO GUTIERREZ
Minister of Development

RISING exports of its principal products, and in the level of foreign and internal trade, diversification of industry, extensive electrification plans, modernization of methods of production, increase in purchasing power, and planning and technology of organisms supervising development of national industry have made Venezuela a country on the move which in five vital branches of production occupies first place among the nations of the American continent.

Plans under way, and studies being carried out, reveal unquestionably a bright economic future for this important South American country which has won such recognition in the international economic field.

Steel and Hydroelectric Power: When work was begun to harness the hydroelectric potential of the Caroní River, it reflected serious study of the influence of electrification on the development of the Venezuelan Guayana and the general economy of the country.

The natural resources concentrated in the Guayana zone are so outstanding that their constant and progressive use would touch off intense development of that part of the country. Thus iron mines with huge reserves are being worked on both sides of the Caroní. The existence of manganese, and aluminum ores, and other elements of industrial importance, have also been proved. All this, combined with the proximity of the petroleum fields of the eastern part of the republic, and the largest gas reserves in the country, as well as the installation of the national steel industry, justifies the investment of the Venezuelan government now under way in the Caroní region to convert the river rapids into hydroelectric wealth. For this purpose, a potentially productive zone of enormous capacity has been defined, with a radius of 187 miles centering on San Félix, which will benefit from the installation of the first electrical plant.

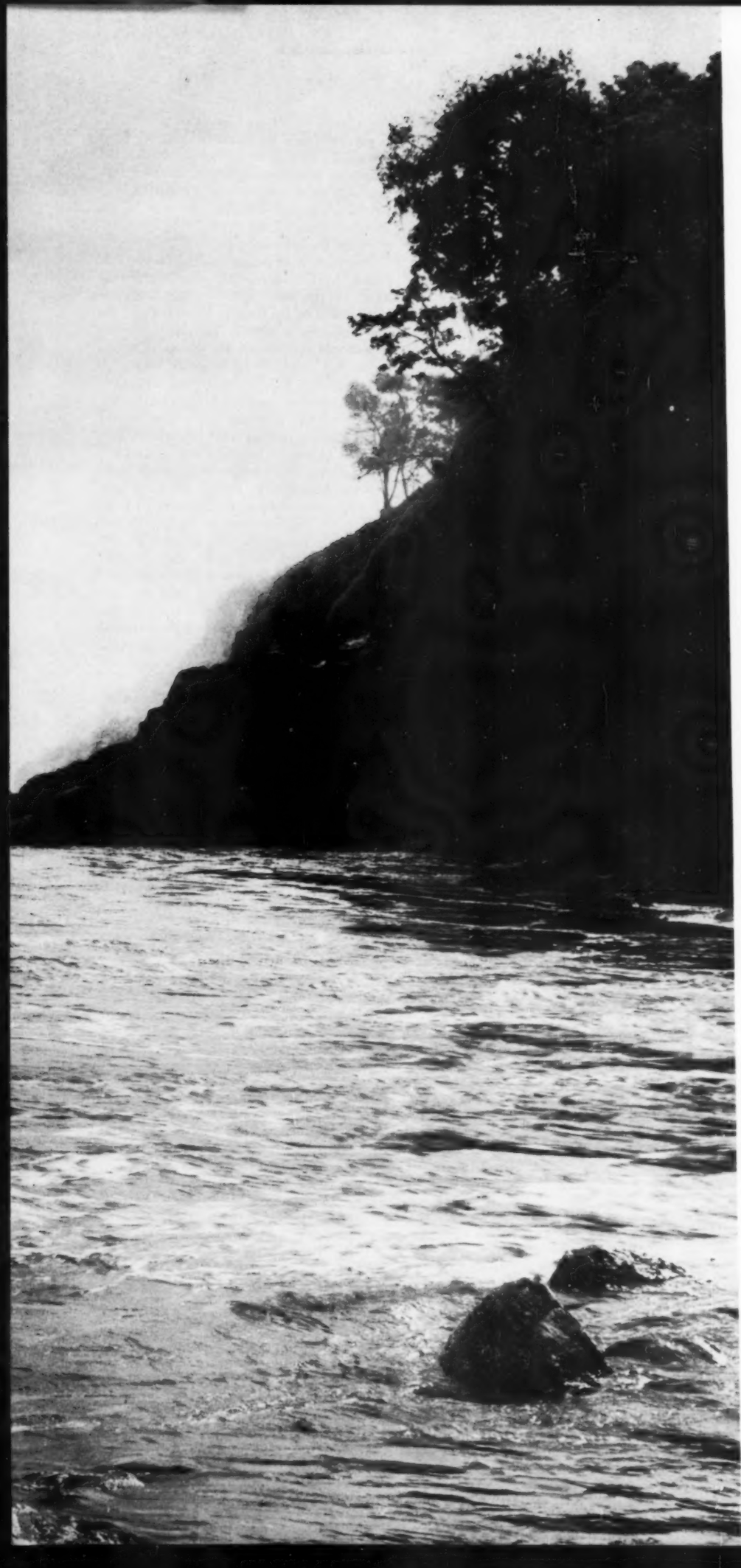
The electrification of the Caroní is proceeding in two stages:

CARONÍ DEVELOPMENT—*First Stage, Immediate Development* (under construction)—*Macagua 1:* first semester of 1958, 50,000 kw; first semester of 1959, 200,000 kw; cost, 120 million bolívares ($40 million)—600 bolívares per installed kilowatt, approximately.

Second Stage, Development in the Near Future—The second phase of the project includes the construction of huge dams which permit control of the hydraulic system of the river. The dams and corresponding reservoirs will constitute projects of first magnitude on a worldwide scale.

Final objective of the project is as much to utilize the electrical energy provided by the Caroní River as it is to contribute to the large-scale industrialization of the Guayana region, adding its latent resources to the national economy.

After the Orinoco, the Caroní occupies second place among the rivers of the country. Its hydroelectric potential is even more important. The median annual rainfall of the zone is never less than 1,800 mm (72 in.). Its hydroelectric basin covers 96,000 sq km (37,056 square miles). Maximum volume measured is 15,000 cu m per sec, and its normal mean is 4,600 cu m per sec—which, combined with the pronounced descent of its bed, determines the possibilities of using its energy. In the lower Caroní



Río Caroní

alone, there is a potential of 4,000,000 kw. All these characteristics place the Caroní among the world's most important rivers known for their great, already industrialized hydroelectric potential.

At present, first stages of the project are on schedule, with the mentioned plans to develop hydroelectric energy during the first semester of 1958 at a cost of approximately 120 million bolívares. The Macagua No. 1 plant has a capacity of 300,000 kw. The waterfall has a height of 40 m (about 120 ft); the machinery building is 590 yards long, 98.4 yards high, with six French-type units capable of producing up to 86 hp, and six generating units with minimum capacity of 50,000 kw each, and maximum of 62,000 kw.

As can be seen, electrification of the Caroní is one of the most daring and best technically-sound projects in Latin America. Its impact on the future is invaluable, and it is further strengthened with the recent announcements of the Venezuelan Ministry of Development ("Fomento") with relation to the increased capacity for production of the national steel industry, which will obtain greater capacity through the Caroní hydroelectric plant. By 1958, at a cost of 1,058 millions of bolívares (about $353 million), Venezuela will have its steel industry functioning. In 1960, installations will be completed through which it will be possible to produce 425,000 tons annually, due to the signing of a new contract which Minister of Development, Dr. Silvio Gutierrez, on behalf of the national government, arranged with Innocenti Co., in charge of carrying out this economically significant project.

With the installation of a steel industry, Venezuela comes into the forefront among Latin American nations which have industrialized iron. According to the terms of the contract and the financial status of the country, Venezuela will have paid its obligations during the 1963-64 period, and the plant will have paid for itself in from 15 to 18 years. The amortization can be even more rapid, if present prices, the world tendency towards inflation, and the increase in petroleum production and consumption are considered.

Six thousand workers will contribute their efforts to the installation of the Venezuelan steel industry, and a considerable number will lend their services when production begins on a regular schedule. The electrification of the Caroní River, and the national steel industry, will make a positive contribution to the future economic development of Guayana, and of Venezuela in general.

The Caroní hydroelectric plant—project of evident technical complexities, and planned for 200,000 kw in its first stage—will be in a position to produce energy in early 1958. It will satisfy urgent industrial requirements. It will incorporate outlying zones of Venezuelan territory into the national production rhythm; and, together with the steel industry, will be the nucleus of an unsuspected regional development with beneficent results for the entire Venezuelan nation and for the American continent.

Venezuela and Her Foreign Commerce: Despite a policy of broad industrial protection which is being carried out at present, Venezuela is forced to import certain raw materials and complementary goods in addition to those produced by the country. Along these lines, the government protects the production of various articles through a licensing system—among them being woolen textiles, the importation of which is dependent on the presentation of paid bills for double the amount in nationally manufactured textiles. During 1956, 495 licenses were granted for a total of 241,629 kg (about 531,583 lb).

When it is necessary to import milk, a vital element in the Venezuelan diet, the importer must obtain the respective license with exoneration of customs duties. The established proportion is 1 kg of powdered milk produced in the country for each 6 kg imported. During 1956, there were 550 licenses granted for a total of 33,719,960 kg (about 74,183,900 lb).

The installation of four tire-and-tube factories in the country, whose production is sufficient to satisfy ordinary demands, has stopped the importation of tires—only those of a size not produced in Venezuela being permitted entry—and in those cases there is no restriction on quantity. In 1956, there were 156 licenses for a total of 26,618 units. A mixed commission, which includes representatives of commerce and industry, considers all import applications sent to the diverse offices of the Ministry of Development by the interested parties.

Importation of shoes, hides, meats, and frozen fowl is permitted only for special kinds not produced in the country. Potatoes and onions, which used to be an import, are now acquired totally in Venezuela, thanks to national production. By the same token, butter has ceased to be imported.

Venezuela's policy concerning wheat, in its international aspects, is defined by the signing of the international wheat agreement. This agreement went into effect, July 31, 1956. It will be in effect until July 1959. In general, it corresponds to the same principles and directives of the previous one, but with fundamental modifications in the matter of basic prices. In terms of this agreement, Venezuela will acquire 170,000 tons during each crop year. The requirement for previous licensing is fundamental in order to comply with the clauses of the agreement, and in the adjudication of the licenses—thus contributing in a very special manner to private enterprise, represented by sections in the commission designated for that purpose.

The flour-market situation in Venezuela can be judged by the fact that, during the crop year of 1955-56, the Ministry of Development granted 7,012 licenses for a total of 3,225,369 bags of flour, and 20 licenses for 486,337 bags of wheat, under the international agreement. Aside from this, there were granted 3,085 licenses for wheat flour, and 48 which covered the importation of 106,036 sacks of wheat in grain.

For 1948, the apparent consumption was 94,332 metric tons, or 2,079,455 bags. Estimates for 1958 give us 218,990 tons (metric) or 4,827,928 bags. These data reveal the relatively uniformly ascending tendency of the use of flour in Venezuela.

As a consequence of the increase in the consumption of wheat flour in Venezuela, a national flour-grinding industry has been built up. Although a high percentage of wheat must be imported, the importance of

(*Continued on page 66*)

Table II
Venezuelan exports of coffee and cocoa during 1956
EXPORTACIONES DE CAFE y CACAO DURANTE EL AÑO 1956

DESTINATION	COFFEE / CAFE		COCOA / CACAO	
	Kilograms	Bolívares	Kilograms	Bolívares
United States	18,614,727	83,901,039	13,439,967	26,865,198
Germany	3,024,561	12,218,297	1,525,723	3,170,158
France	1,031,221	3,883,774	196,732	447,452
Belgium	324,920	1,314,005	1,215,613	2,466,520
Holland	156,659	681,598	593,231	1,250,430
Denmark	6,125	23,004	10,103	20,130
Sweden	32,183	121,401	2,306	6,840
Japan	123,526	488,736	61,567	131,496
Curacao	3,000	14,820	—	—
Italy	35,920	130,973	589,143	1,189,578
Colombia	—	—	414,485	822,000
England	61	274	20,074	71,691
Other countries	24,431	88,581	460,938	933,980
Total:	23,377,134	102,866,502	18,529,882	37,375,473

Table III
Exports of iron ores and of petroleum and derivatives, in 1956
Exportaciones de hierro, petróleo y derivados en 1956

	IRON ORES / MINERAL DE HIERRO		PETROLEUM AND DERIVATIVES / PETRÓLEO Y DERIVADOS	
United States	9,355,330,940	215,071,939	42,284,150,997	2,356,477,934
England	680,141,830	14,271,960	6,758,185,945	408,233,004
Holland			3,830,645,195	193,503,858
Germany	601,794,460	12,562,975	540,193,364	31,707,038
Italy	172,560,340	3,703,144	1,057,650,020	54,057,866
Curacao			18,077,782,877	899,203,582
Aruba			25,498,551,865	1,246,542,530
Brazil			4,969,346,771	307,551,421
Trinidad			2,965,394,099	165,520,590
Canada			2,458,545,186	154,623,480
Argentina			2,889,450,893	174,297,344
Other countries	83,274,210	1,771,459	10,896,934,723	656,405,207
Total:	10,893,101,780	247,381,477	122,226,831,935	6,648,123,854

portante. La precipitación fluvial media anual de la zona no baja de 1.800 mm. Su hoya hidrográfica cubre 96.000 Km.^{2} Su caudal máximo aforado es de 15.000 m^3./segundo y su caudal medio normal es de 4.600 m^3./segundo, lo que aunado al pronunciado descenso de su cauce, determina las posibilidades de su aprovechamiento enérgético. En el bajo Caroní, unicamente, se avalúa un potencial de 4. millones de kilovatios. Todas estas características sitúan al Río Caroní al lado de los más importantes del mundo conocidos por su gran potencial hidroeléctrico ya industrializados.

En la actualidad los trabajos de la primera etapa marchan dentro de los planes previstos para aprovechar a un costo aproximado de 120 millones energía hidroeléctrica en el primer trimestre de 1958. La planta Macagua N° 1—cuenta una capacidad de 300.000 Kw. La caída de agua una altura de 40 metros, la Casa de Máquinas una longitud de 180 mts. y altura de 30 mts. 6 unidades del tipo Francis, capaces de producir hasta 86 mil hp. y 6 unidades generadoras—con capacidad mínimas de 50.000 Kw. c/u y máxima de 62.000 Kw.

Como se observa, pues, la obra de electrificación del río Caroní es de las más atrevidas y técnicamente mejor concebidas que se conozca en la America Latina. Su proyección futura es invalorable y se robustece más aún con los anuncios hechos recientemente por el Ministro de Fomento de Venezuela en relación con el incremento de la capacidad productiva de la Industria Siderúrgica Nacional, que recabará de la Planta Hidroeléctrica del Caroní mayor capacidad de producción. A un costo de 1.058 millones de bolívares Venezuela tendrá funcionando su Industria Siderúrgica para el año de 1.958. En 1960 estarán terminadas todas las instalaciones, por lo cual la producción de 425 mil toneladas al año será posible gracias a la firma del nuevo contrato que el Ministro de Fomento, Dr. Silvio Gutiérrez, suscribiera a nombre del Gobierno Nacional, con la empresa Innocenti que es la encargada de llevar a cabo esta obra de gran alcance económico.

Table I
FOREIGN TRADE
COMERCIO EXTERIOR

Value of exports and imports during the years 1940-55, and from January to December 1956

Valor de las exportaciones e importaciones realizadas durante los años 1940-1955 y los meses de enero a diciembre de 1.956.

Años / Years	EXPORTS / EXPORTACIONES (Bolívares)	IMPORTS / IMPORTACIONES (Bolívares)
1940	860,908,685	311,169,243
1941	1,061,564,329	287,825,392
1942	710,546,329	215,691,215
1943	862,085,143	222,059,810
1944	1,121,365,579	544,197,180
1945	1,107,852,690	804,947,760
1946	1,449,110,671	987,155,774
1947	2,168,330,070	1,872,184,958
1948	3,484,417,508	2,809,799,652
1949	3,360,487,618	2,298,013,604
1950	3,892,197,742	2,000,643,708
1951	4,533,660,335	2,281,889,857
1952	4,858,440,172	2,542,343,955
1953	4,481,712,308	2,748,940,967
1954	5,660,989,648	2,745,803,659
1955	6,277,694,091	2,959,633,695
1956	7,114,193,637	3,438,443,383

Con la instalación de la Industria Siderúrgica, Venezuela se coloca en primera fila entre las Naciones Latinoamericanas que industrializan el hierro. De acuerdo con el contrato en referencia y la capacidad fiscal del país, Venezuela cancelará sus obligaciones en el período 1963-64, siendo que la planta se pagará a sí misma en un plazo que ha sido calculado entre 15 y 18 años, estimandose que el plazo pueda ser más corto si se toman en consideración los precios actuales, la tendencia alcista que se observa y el aumento de la explotación petrolera que implica mayor consumo.

Seis mil trabajadores contribuiran con su esfuerzo a la instalacion de la Industria Siderúrgica Venezolana y un número bastante considerable prestará sus servicios en la misma cuando comienze su producción en firme. La electrificación del Río Caroní y la Industria Siderúrgica Nacional contribuiran determinantemente en el futuro económico de la Guayana y de Venezuela en general.

La Planta Hidroeléctrica del Caroní, obra de evidentes complejidades técnicas y proyectadas para doscientos mil kilovatios en su primera etapa, estará en condiciones de producir energía a principios de 1958. Satisfará requerimientos industriales perentorios; incorporará apartadas zonas de nuestro territorio al movimiento nacional de producción y junto con la Siderúrgica, será el núcleo de un insospechado desarrollo regional con beneficiosas proyecciones para la Nación venezolana y para el Continente americano.

Venezuela y su comercio exterior—Venezuela, pese a la amplia política de protección industrial que actualmente se adelanta, se ve en la necesidad de importar determinadas materias primas fundamentales a la Industria Nacional o complementarias de las que se producen en el país. En este sentido, el Gobierno proteje mediante el sistema de licencia la producción de varios artículos, entre otros los siguientes; telas de lana, para cuya adquisición en el extranjero es necesario presentar factura por la compra del doble de telas nacionales. Durante el año de 1956, las licencias concedidas sumaron 495 por un total de 241.629 kilogramos.

La leche, alimento tan vital en la dieta del pueblo venezolano, cuando es objeto de importación es necesario que el importador obtenga la licencia respectiva con exoneración del pago de los derechos arancelarios. La proporción establecida es de un kilogramo de leche en polvo producida en el país para cada seis importados. Durante el año 1956 fueron concedidas 550 licencias por un total de 33.719.960 kilogramos.

La instalación de cuatro fábricas de neumáticos y cámaras de aire en el país, cuya producción es suficiente para abastecer la demanda de medidas corrientes, has paralizado la importación de cauchos, permitiendose solamente la de aquellas medidas que no sean producidas en Venezuela, en cuyo caso no hay restricción sobre la cantidad. En 1956 se concedieron 155 licencias por un total de 26.618 unidades. Una Comisión mixta, que incluye representantes del comercio y la industria, considera en cada oportunidad las solicitudes de importación enviadas a los Organismos respectivos del Ministerio de Fomento por los diversos interesados.

La importación de calzados, pieles, carnes y aves congeladas solamente se permite para tipos especiales no producidas en el país. Las papas y cebollas, que eran objeto de importación, debido a la producción nacional, son adquiridas totalmente en Venezuela. De la misma manera, la mantequilla ya dejó de ser adquirida en el extranjero.

La política seguida en Venezuela, en materia de trigo en el aspecto internacional, se definió mediante la suscripción del convenio internacional—del trigo. El acuerdo entró en vigencia el 31 de julio del 56. Regirá hasta julio del 59. Y corresponde, en líneas generales a las mismas directrices y principios del anterior, pero con modificaciones fundamentales como las que se requiere a los precios básicos. Venezuela adquirirá, en base al convenio, 170. mil toneladas durante cada año cosecha. El requisito de licencia previa es fundamental para hacer cumplir las cláusulas establecidas en el convenio y en la adjudicación de las licencias, contribuye de manera muy especial la actividad privada que se encuentra representada a través de las Cámaras en la Comisión que ha sido designada al efecto.

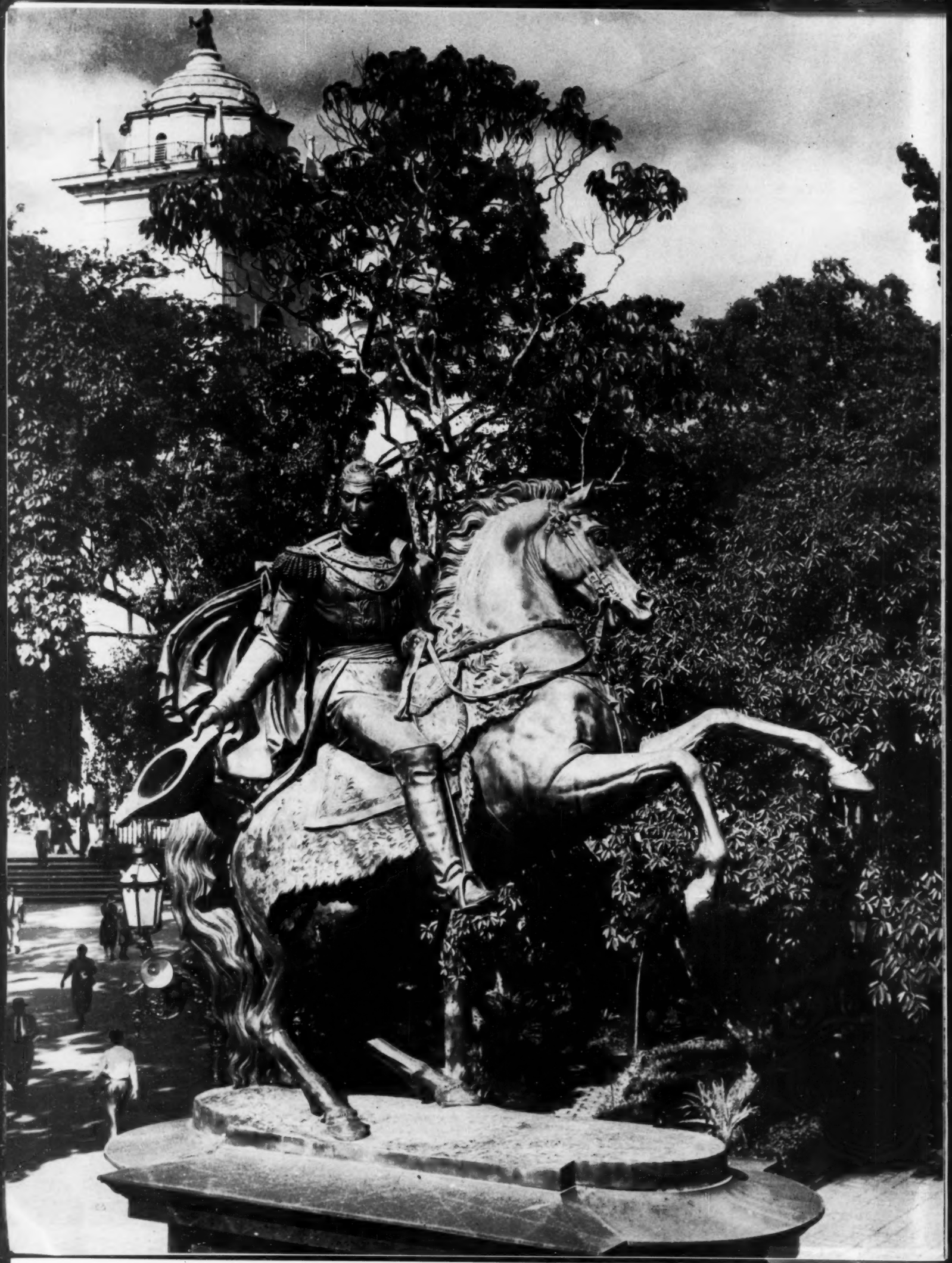
La situación del mercado harinero en Venezuela se puede determinar por el hecho de que durante el año cosecha 1955-56 Fomento acordó 7.012 licencias por un total de 3.225.369 sacos de harina y 20 licencias por 486.337 sacos de trigo dentro del convenio internacional. Fuera de éste se emitieron 3.085 licencias de harina de trigo y 48 que ampararon la importación de 106.036 sacos de trigo en grano.

Para 1948 el consumo aparente fué de 94.322 toneladas métricas o sean 2.079.455 sacos. Los cálculos estimados para 1958 nos dan 218.990 toneladas métricas o sean 4.827.928 sacos. Estos datos revelan la tendencia relativamente uniforme y ascendente de harina en Venezuela.

Consecuentes con este aumento del consumo de harina de trigo, en Venezuela ya se ha estructurado una industria molinera nacional. Aunque prácticamente el trigo en un porcentaje bastante elevado, deberá ser importado, la importancia de la industria se revela por el ahorro de divisas que estará representado por la diferencia entre el precio de la harina y el trigo en grano.

Table IV
General Industrial Production Index
Índice Industrial General de Producción
(1948 = 100)

	Incl. Petroleum Refining / Con Inclusion de Petróleo Refinado	Not Incl. Petroleum Refining / Con Exclusion de Petróleo Refinado
1948	100	100
1949	116.7	114.5
1950	139.8	130.3
1951	164.9	159.9
1952	198.2	183.4
1953	231.7	216.2
1954	276.6	261.1
1955	324.6	303.5
1956	337.3	314.3



Desde el punto de vista práctico hace posible el almacemamiento de grandes cantidades del grano para cubrir cecesidades de emergencia en caso de imposibilitarse la importación. Por otra parte, la industria en referencia constituye una fuente de trabajo e inversión. En julio de 1956 comenzó a funcionar la primera planta y ya se han proyectado otras en el litoral caraqueño, Puerto Cabello, Chivacoa y Maracaibo. Para 1958 la producción de harina—en el país alcanzará, aproximadamente, al 49% del consumo nacional. La industria estará en capacidad de competir tanto en precio como en calidad con la harina importada, por lo cual el Ministerio de Fomento ha decidido protegerla mediante cupos de importación que sean la diferencia entre el consumo y la producción nacional.

El movimiento expansivo del comercio exterior de Venezuela, continuó en forma favorable. Las importacines ordinarias alcanzaron un valor de 3.438.443.383,oo bolívares y un volumen de 2.959.632.695 kilogramos, lo cual representan un aumento en relación con el año de 1955 de 16,18 y 3% respectivamente. En las exportaciones se ha produciod un alza apreciable que correspondió al 13,32% con respecto al año 55, constituyendo un hecho significativo la multiplicidad de los productos exportables, ya que además del petroleo y sus derivados, minerales de hierro, café y cacao, se formalizaron ventas en el exterior de diamantes, azúcar, amianto, manganeso y oro.

Otros índices reveladores del movimiento Exterior venezolano son los que se refieren a la exportación de café y cacao, productos estos que siempre han contribuído al movimiento económico del país.

Por lo que respecta a las exportaciones de mineral de hierro y petróleo, que en la actualidad constituyen dos factores importantisimos de las bases de la economía venezolana, los índices correspondientes a 1956 son bastante elocuentes.

En el orden interno, la actividad comercial se podría calibrar por el movimiento de seguros. Principalmente en los años de post-guerra se ha incrementado de una manera paralela al desarrollo económico del país. No solo en lo que respecta a la inscripcción de nuevas Empresas, sino al movimiento de las operaciones de esta índole. En la actualidad funcionan en Venezuela 50 empresas de seguro, ll de las mismas llenaron sus requisitos a partir de 1956. Las primeras alcanzaron para 1956 a 202.304.000.oo bolívares, lo cual representa un incremento del 21% más que el recaudado en 1.955. Los capitales asegurados para el mismo año fueron de B'. 18.360.354.-000, y para 1956 se elevaron a 26.023.882.-000 bolívares que representan un aumento de 41.74%.

En consideración a la importancia que ha cobrado la actividad aseguradora en Venezuela, el Ministro de Fomento someterá a la consideración del Congreso Nacional un anteproyecto de ley que contempla tanto el desarrollo del seguro como un articulado apto para garantizar que las actividades en referencia sean realizadas por empresas económicas y jurídicamente capaces; que los ahorros de la colectividad estén respaldados suficientemente por inversiones solventes para hacer frente a los compromisos con sus asegurados así como también para que los contratos de seguros se justifiquen y sean ajustados a las concretas y efectivas realidades del mercado.

Las compañías de seguros establecidas en Venezuela, para responder de los compromisos con los asegurados, mantienen un respaldo que alcanzó en 1956 a 476.602.000 bolívares que representa el 193% de las sumas que por igual concepto había en 1950. El índice de cobertura, o sea la relación entre los compromisos y los aseguarados y las cantidades que respaldan dichos compromisos fué en 1956 de 1.49, o sea que para cada bolivar de compromiso con los asegurados hay un promedio de bolívares 1.49 para hacerle frente a dichos compromisos. Las garantías que de acuerdo con la ley deben prestar las compañías de seguros a la Nación venezolana alcanzaron para el 31 de diciembre de 1956 a 17.929.024 bolívares representados en bonos y acciones de institutos autónomos y sociedades anónimas, depósitos en efectivo, hipotecas y créditos hipotecarios, que se encuentran bajo custodia en diferentes bancos de los cuales no pueden ser movilizados sin previa y formal autorización del Ministerio de Fomento.

Desarrollo Industrial—Venezuela, tal como lo revelan las cifras es una Nación en pleno auge industrial. Su crecimiento continúa ininterrumpidamente. En el lenguaje de las cifras, 1956 representa un año de verdadera proyección industrial. El movimiento de inscripción de empresas pone de manifiesto una inversión de 113.772.281.00 de bolívares y la política de protección se hizo patente mediante la concesión de exoneración de derechos arancelarios para la importación de materias primas y otros artículos por un valor global de 87.416.22,oo bolívares.

El índice general elaborado por el Banco Central de Venezuela indica que el país vió elevar en 1.956 su producción manufacturera en 237,3% respecto del año 1.948. Con exclusión del petróleo refinado, este índice se sitúa en 214,3. Si bien en el período considerado el incremento medio anual es de significativa importancia, pues alcanzó un 29,3%, en 1.956, el incremento de la producción se elevó tan sólo en 10,9. respecto de 1.955, debido a los grandes aumentos operados en los años anteriores.

Los grupos industriales más desarrollados durante el año pasado, con relación a 1.955, y en base a 1.948, fueron los siguientes: ropa hecha, caucho, otras industrias (comprende desde alimentos para animales hasta productos plásticos y carrocerías), productos químicos, papel y cartón.

El éxito alcanzado por Venezuela en su desarrollo industrial se debe, indudablemente, en buena parte, a una serie de medidas que dentro de una sana política económica ha tomado con tal fin el Gobierno nacional. Entre ellas señalamos las siguientes:

a) Créditos industriales
b) Exoneraciones o rebajas en los derechos de importación
c) Protección arancelaria
d) Señalamiento de cupos y licencias de importación
e) Subsidios.

Creditos Industriales.—La necesidad de transformar los sistemas de financiamiento para nuevas industrias, hizo necesario la implantación de un sistema de crédito que contempla intereses reducidos y plazos largos para reembolso del capital. De esta manera se ha tratado de complementar la acción del capital privado en el campo financiero, sin competir con el mismo ni coartar su natural función creativa pero con criterio distinto al que priva en. los inversionistas particulares.

Así, mientras éstos aspiran a obtener beneficios económicos inmediatos y requieren amplias garantías que respalden en todo momento el monto de sus inversiones, el Estado busca esencialmente la creación de nuevas fuentes de trabajo, de producción y de consumo, dejando a un lado las consideraciones de carácter meramente comercial.

Hasta el año 1954 el Ministerio de Fomento había concedido a la pequeña industria 6.011.427.65 bolívares.

Tanto las exoneraciones, como las protecciones arancelarias, los cupos y licencias de importación y el sistema de subsidios son medidas que han sido tomadas por el Gobierno de Venezuela a través del Ministerio de Fomento para favorecer la industria nacional. Las exoneraciones constituyen una ayuda de gran importancia hasta tal punto que la industria no podria subsistir con base competitiva y económica si no pudiera importar con dicho beneficio total y parcial de los derechos aduaneros todas las maquinarias, implementos, útiles y materias primas que requiere. Desde 1948 hasta 1956 el Estado venezolano ha concedido a la industria por ese concepto beneficios que sobrepasan los 795 millones de bolívares.

La elevación de los derechos arancelarios, para aquellos productos cuya importación perjudica la colocación en el mercado interno de los productos similares nacionales, que constituye la base de la protección arancelaria, ha resultado bastante favorable en Venezuela. Estas medidas se toman cuando resultan justificadas, respetando siempre los compromisos adquiridos en los convenios comerciales vigentes con otros países. Se ha podido comprobar que las repercusiones que este aspecto de la protección industrial tiene en la economía nacional son de tal significación que ninguna medída de tal índole ha sido adoptada sin un riguroso estudio de todos los factores afectados así como de su trascendencia en el conglomerado nacional.

(*Sigue en la página 69*)

◄ *Simón Bolívar*

(Continued from page 62)

the industry is revealed by the savings in foreign exchange which will be represented by the difference in the price of the flour and the grain wheat. From a practical point of view, this makes it possible to warehouse great quantities of grain to cover emergency situations in case it is impossible to import. On the other hand, the industry in reference constitutes a source of labor and investment. The first plant began to function in July 1956, and others have been projected on the coastline of Caracas, Puerto Cabello, Chivacoa, and Maracaibo. By 1958, the production of flour in the country will reach approximately 49% of national consumption. The industry will be in a position to compete in price as well as quality with imported flour, as a result of which the Ministry of Development has decided to protect it through importation quotas which represent the difference between national production and consumption.

The expansion of Venezuela's foreign trade has continued favorably. Ordinary imports reached a volume of 3,438,443,383 bolívares, and a volume of 2,959,632,695 kg, which represents an increase over 1955 of 16%, 18%, and 3%, respectively. Exports increased appreciably, being 13.32% higher than in 1955. What is significant is the multiplicity of the exportable products; in addition to petroleum and its derivatives, metal (iron) minerals, coffee and cocoa, sales were made abroad of diamonds, sugar, asbestos, manganese, and gold.

The value of exports and imports from 1940-56 is as given in Table I.

Other revealing indexes of Venezuelan foreign trade are those which refer to the export of coffee and cocoa—products which have always contributed to the economic activity of the country, as indicated by Table II.

With respect to exports of iron ores and petroleum, which at present constitute two vitally important factors in Venezuela's basic economy, the indexes corresponding to 1956 are rather significant, as shown by Table III.

Internally, the commercial movement can be measured by the volume of insurance. Especially in the postwar years, this has increased in a manner parallel to the economic development of the country. Not only is this true with respect to the registration of new companies, but in the volume of operations of this kind. At present, 50 insurance companies operate in Venezuela—11 of which became eligible beginning with 1956. These (50 companies) obtained 202,304,000 bolívares in premiums in 1956, which represented an increase of 21% over those collected in 1955. Insured capital for that year was 18,360,354,000; and for 1956 it rose to 26,023,882,000 bolívares, which represents an increase of 41.74%.

Considering the importance insurance activity has achieved in Venezuela, the Ministry of Development will submit for the consideration of the Congress a proposed bill which envisions the development of insurance, at the same time guaranteeing that insurance activity is carried out by companies which are legally and economically capable; that the savings of the organization are sufficiently backed by liquid assets so as to comply with the companies' obligations with the insured, as well as assuring that the insurance contracts are justified, and adjusted to the concrete and effective facts of the market.

In order to be able to meet their obligations with their clients, Venezuelan insurance companies maintain liquid assets which in 1956 totaled 476,602,000 bolívares, representing 193% of the sums available for the same purposes in 1950. The index of coverage, i.e., the ratio between the obligations and the insured and the amounts which back those obligations, in 1956 was 1.49. That is, for each bolívar of obligation with the insured, there is an average of 149 bolívares to meet these obligations. The guarantees which the insurance companies must provide for the Venezuelan nation, in accordance with the law, by December 31, 1956 had reached the sum of 17,929,024 bolívares, represented in bonds and shares of autonomous institutions, corporations and cash deposits, mortgages and banking credits, in the custody of different banks, and which cannot be disturbed without prior and formal authorization of the Ministry of Development.

Industrial Development: As the figures show, Venezuela is a nation in full industrial upsurge, whose growth continues uninterruptedly. In the language of figures, 1956 was a year of real industrial advancement. Company registrations reveal an investment of 113,772,281 bolívares, and the policy of protection is manifest in the granting of customs-duties exonerations for the importation of raw materials and other articles for a grand total of 87,416,220 bolívares.

The general index prepared by the Banco Central de Venezuela shows that the country raised its manufacturing production for 1956 by 237.3% as compared with 1948. With the exception of refined petroleum, this index would be 214.3%. Although the annual average in the period considered was 29.3%, the increase in production for 1956 was only 10.9 (over 1955) due to the large increases experienced in previous years.

The industries most developed last year as compared with 1955, and using 1948 as a base, were the following: ready-made clothes, rubber, other industries (including transformations of animal foods to plastic products and vehicle bodies), chemical products, paper and cardboard.

The index of industrial production—including, and excluding, petroleum refining—is given in Table IV.

The success achieved by Venezuela in its industrial development is undoubtedly due, in large part, to a series of measures taken by the national government in line with a healthy economic policy. Among these (measures) we can point out the following: (a) industrial credits; (b) exonerations or reductions in import duties; (c) protective customs tariffs; (d) allotment of quotas and licenses for imports; (e) subsidies.

Industrial Credit: The necessity of transforming financing systems for new industries made necessary the establishment of a credit system which provides for lower interest rates and long-term amortization of capital. In this manner, an effort has been made to complement the role of private capital in the financing field, without competing with it, or inhibit its natural creative function, but with a different criterion from that which obtains among private investors.

Thus, whereas these (private investors) hope to obtain immediate financial returns, and require ample guarantees insuring their total investment at all times, the State essentially seeks the creation of new sources of labor, production, and consumption—ignoring considerations of a purely commercial character.

Up to 1954, the Ministry of Development had granted 6,011,427.65 bolívares to small industries.

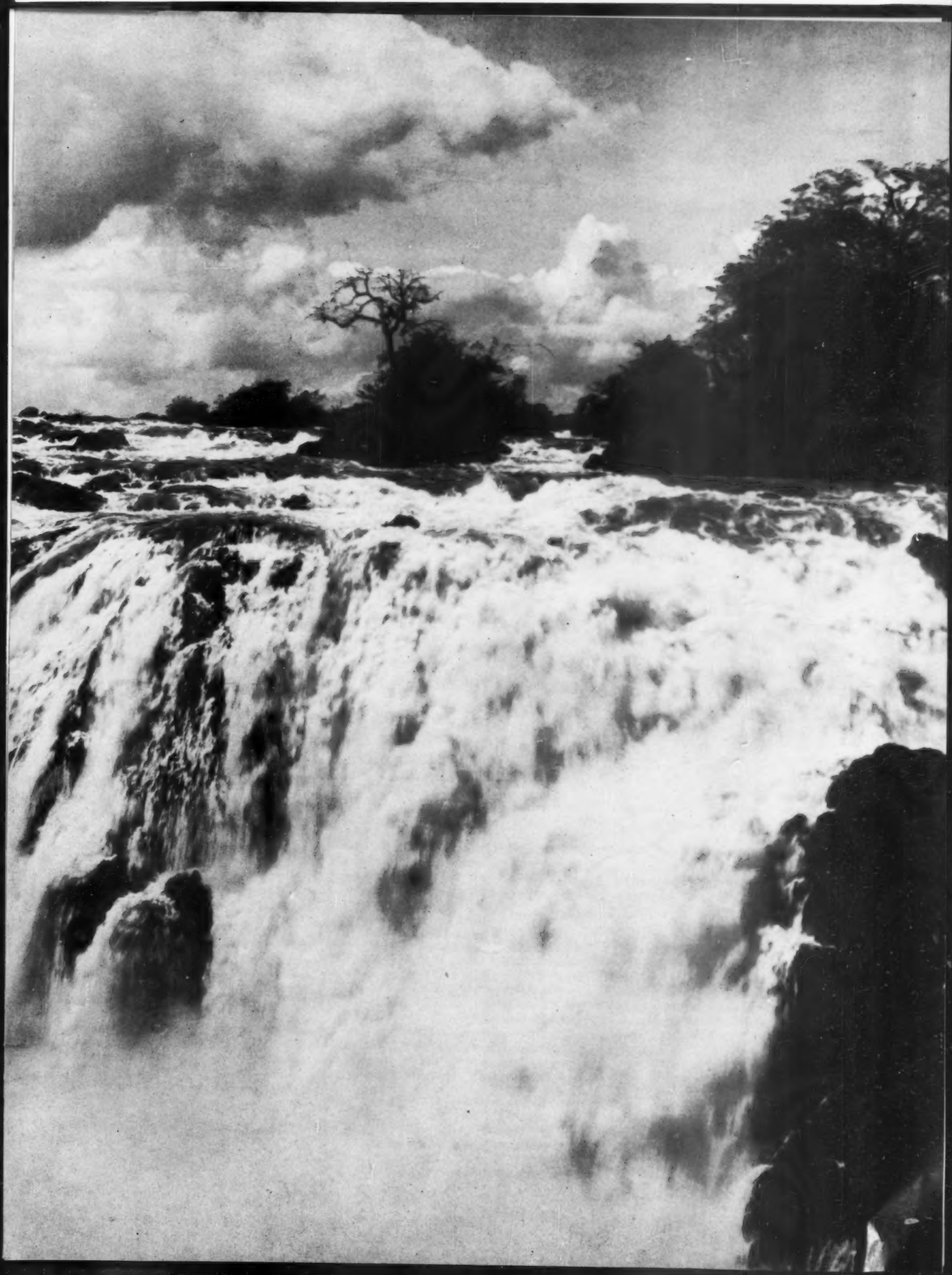
All these measures—tariff protection, quotas and licenses for importation, and the subsidy system—were taken by the Venezuelan government, through the Ministry of Development, to encourage national industry. The exemptions are of such great importance that industry could not exist on a competitive basis if it could not import with these partial and total benefits in customs duties all the machinery, implements, supplies, and raw materials it requires. From 1948 to 1956 the Venezuelan government granted benefits to industry in this manner to the value of more than 795 millions bolívars.

The raising of customs duties on those products whose importation would prejudice the market for similar nationally produced goods—which constitutes the basis of the protective tariff system—has given substantially favorable results in Venezuela. These measures are taken when justified—always, however, respecting obligations undertaken in commercial treaties with other countries. The repercussions which this aspect of industrial protection have had on the national economy have proved of such significance that no such measures have been adopted without previous vigorous study of all the factors affected, as well as the general effect on the nation.

With respect to quotas and import licenses, these too have been applied as measures designed for industrial protection—principally in connection with those articles the national production of which is most retarded by foreign competition. These restrictions have been applied to such products as (a) cotton textiles; (b) shoes; (c) powdered milk; (d) woolen textiles; and (e) artificial silk.

Finally, in the matter of industrial protection, Venezuela—with the objective of

Salta Macagua
Macagua Falls ►



La Gran Sabana—Great Venezuelan Plain

favoring the national consumer, and stimulating the development of certain vital industries—has accorded special subsidies. Among the most important, conceded through the Ministry of Development, is the milk subsidy, in virtue of which 0.15 (bolívar) is paid throughout the country for each liter of pasteurized milk sold—this subsidy going directly to the producer of raw milk. From 1948 to 1956, the government paid 62 million bolívares on this subsidy.

Along with the economic development of Venezuela, the preoccupation for encouraging and protecting industrial and commercial activity made possible the furthering of studies on the structure of the registering of industrial property. In 1955, an instrument of law was promulgated which replaced the laws covering patents, inventions, and trademarks of factories, commerce, and agriculture. This instrument has accomplished a triple mission: unify in one code our legislation regulating industrial properties; introduce new forms and concepts of this property required by present conditions, the development of the economic movement of the country; and to modify and perfect the requirements and procedures established in the matter.

New processes which can be registered are contained in the statute. In addition to invention patents and the trademarks for factories, commerce, and agriculture; patents, models, and blueprints, the new legal ordinance covers introduction and commercial slogans. The influence of the industrial development of the country in the preparation of these legal instruments is evident, since the patent which protects the rights of the inventor becomes null and the invention becomes public property when its owner has allowed two years to lapse without using it. In this manner, together with the right of the inventor to receive the fruits of his labor, the right of society to receive its benefits is also assured.

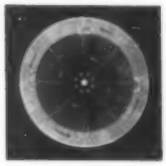
On the other hand, Venezuela observes the principle of administrative flexibility, since the law enables the Recorder to authorize, order, and decide in all cases of procedure. This is true to such an extent that, in 1956 and thus far in 1957, activity in the Office of Records (Oficina de Registro) has far exceeded that of previous years, and the indexes reveal that the administrative process has intensified with the economic development of the country.

Finally, Venezuela has not lagged in assistance at international events directly concerned with this matter, having been represented in the 27th congress of the International Association for Industrial Protection, meeting in Washington in 1956, and at present is preparing to attend the conference at Nice, where a revision will be made of the Madrid agreement on international registry of trademarks for industry and commerce.

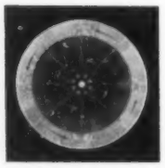
General Economic Planning: In Venezuela, even though production is linked directly to several official dependencies, Development ("Fomento") in effect is really the Ministry of Economy. Thus its organization, in the most technical manner possible, actually constitutes the fundamental concern of the government in accordance with the organic Statute of Ministries.

The Office of Economic Planning and Investigations is charged with studying and ordering matters of general interest which correspond to the functions of this ministry.

(*Continued on page* 144)

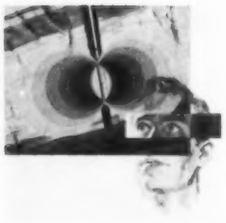


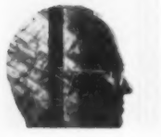
SCHLUMBERGER NEWS



NEW

THE COMBINATION INDUCTION-ELECTRICAL LOG





NEW

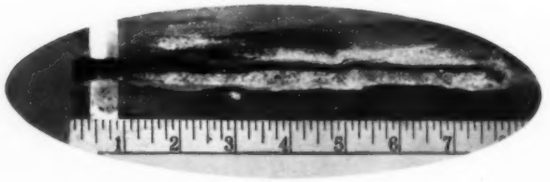
THE CONTINUOUS "POTECLINOMETER" DIPMETER
COMBINED WITH THE NEW OPTICAL COMPARATOR

NEW

SCHLUMBERGER CAPSULE-JET PERFORATOR

NEW

NO-PLUG SHAPED CHARGES

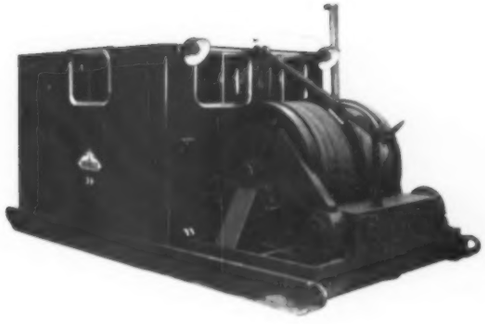


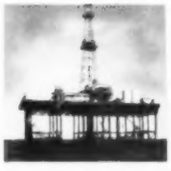
NEW

1500 SERIES TRUCK

NEW

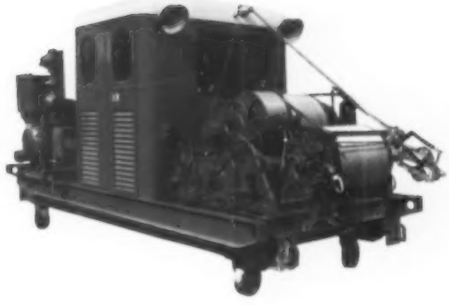
SCHLUMBERGER OFF-SHORE UNIT





NEW

SCHLUMBERGER PRODUCTION SERVICES WINCH



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JOHNSTON

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JOHNSTON TESTERS SERVICES AVAILABLE
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WAS INTRODUCED IN

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SCHLUMBERGER HAS SET

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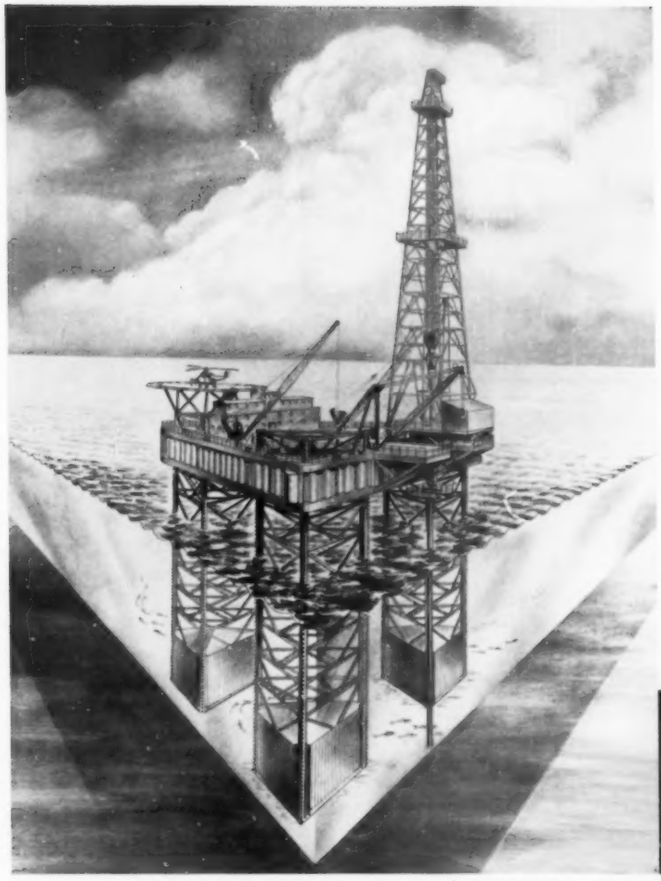


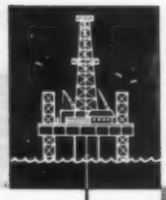
Engineering illustration of LeTourneau Mobile Offshore Platform, showing stiffleg crane used in setting production platform.

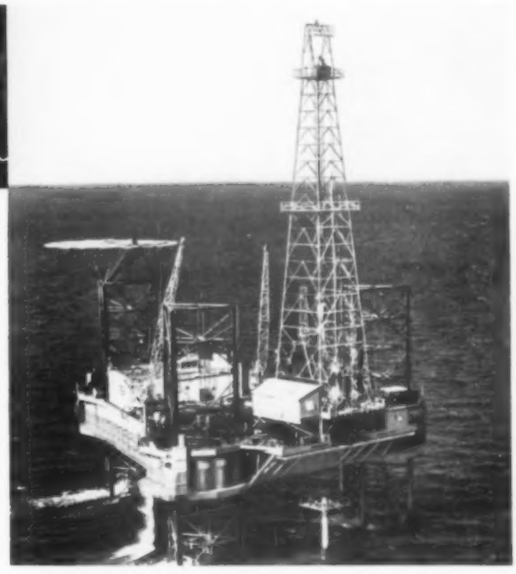
Mobility...

Versatility...

Speed...

LeTOURNEAU mobile platforms now do the complete job from spudding in to setting production platform





Latest LeTourneau-built Mobile Platform to go into operation, Zapata Offshore Co.'s Vinegarroon. Platforms of this class may be equipped to drill to 25,000 ft. in water up to 110 ft. in depth.

LeTourneau Mobile Offshore Platforms now are complete, self-contained units that function as construction or service rigs as well as highly-mobile drilling platforms. When service or derrick barges are not available, the production platform can be set from the drilling platform with a minimum of delay.

This added feature—latest of many—demonstrates the versatility of LeTourneau platforms.

The unique, tripod design, with its electro-mechanical raising and lowering mechanism, permits fast, time-saving location changes. With spuds retracted, the unit becomes a seaworthy barge that is towed to location and self-elevated to the desired height above water. The three spuds are lowered and raised—at the rate of 1 ft. per minute—by electric gearmotors driven by a powerful diesel-electric generating plant.

Independently-operated open-truss spuds enable the platform to withstand severe wave and weather conditions. The platform level may be adjusted by the flick of a switch in the event of scouring or some other unexpected action.

LeTourneau-built anchor winches, which facilitate platform positioning, and revolving deck cranes, servicing the deck and hold areas, are electrically powered. Other features include: movable derrick for multi-well drilling; comfortable, completely air-conditioned crew quarters and living facilities; helicopter landing area with safety net; radio and intercom network connecting strategic points with the office.

Each platform is fabricated with matched and proven components manufactured by R. G. LeTourneau, Inc., which handles every step of production from pouring the steel to final rigging.

Our engineers are available without obligation to discuss your requirements. Inquiries confidential. Write or call us today.

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R. G. LeTourneau, Inc. furnishes Mobile Offshore Platforms for delivery anywhere in the world, completely rigged and ready for drilling. 5 to 8 months delivery, depending upon design.

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Oil and Its Manpower in Venezuela

The Venezuelan oil worker is one of the best paid wage earners in the world petroleum industry, and a man worthy of his hire. He has progressed through intensive periods of training and development until today the oil companies are almost 100% Venezuelan manned in the most skilled labor occupations. Because of rapid expansion and technological advances in the oil industry, plus the demands of other rapidly growing industries for trained Venezuelan talent, however, it is still necessary for the oil companies to hire North Americans and other foreigners for highly specialized technical work.

THIRTY years ago Venezuela was almost completely underdeveloped industrially. Its people were largely bound by tradition and the requirements of their economy to the farm, the ranch, and the sea. Aside from the people concentrated in Caracas and a half-dozen other cities, the people were largely devoted to pastoral pursuits. They were far removed in culture from the modern industrial workman and his family.

In three brief decades the picture has changed dramatically, altered by the great economic transformation which came with the discoveries of rich oil deposits in both the eastern and western parts of the country. Today in Venezuela there is in development a modern industrial work force of ambitious, resourceful, well trained men.

It isn't odd that this transformation has come about, since the economic drives of men the world over are much the same. Given the economic opportunity by the wealth beneath their lands and waters, the modern Venezuelan has reached out for the same gains in compensation and security, the same material things which these can buy for him, as have his North American neighbors. The growing middle class in Venezuela is a rapidly developing prototype of a middle-class group anywhere in the world.

Today's oil workingman in Venezuela is among Latin America's blue-collar aristocrats. His annual earnings average in the neighborhood of $4,500 in terms of his direct cash comings alone. This is not a full $4,500 of purchasing power compared to the same income level in the United States; but, emerging from the substantially lower standard of living of a few years ago, it is an impressive figure indeed.

The makeup of these cash earnings tells a significant story. No more than half of the $4,500 total comes from the worker's basic wages for days worked. The other half comes from a great variety of other direct cash benefits based on the Venezuelan labor law, collective contracts with unions, and oil-company policies. There is rest-day pay (men are paid for the 7th day in a week when they work six), holiday pay, vacation pay (29 to 30 days a year), and a great variety of premium payments for Sunday work, holiday work, overtime, night work, travel time (from home to work site), special occupations, and others.

There is the "utiladades" or profit-sharing provision which requires that at year's end the employer, on the basis of his profits, pay to his workers up to 16-2/3% of their year's pay in a lump sum. All of the major oil companies have been making this maximum payment.

The worker also gets cash for a housing allowance, cash benefits such as employer contributions to savings plans, paid time off the job, disability pay, etc.—all of these non-basic items adding up, on the average, to an amount equal to his basic daily wage.

This is still not the end, since a third pile of Venezuelan bolivars could be stacked up alongside the worker's basic wage and other direct cash earnings. These are the economic extras which the worker doesn't see in direct cash while he is working, but which represent substantial costs to the companies and real benefits to the worker or his family.

Retirement, death, and termination benefits are significant aspects of these payments. Liberal retirement plans cover most Venezuelan petroleum workers, bringing them regular lifetime incomes normally beginning at age 60—five years earlier than common for their fellow oil men in the United States. If the Venezuelan worker leaves his company before retirement, substantial lump-sum payments are in order, depending on his years of service. These are the so-called "cesantía" and "antiguedad" payments which, by law and union contract, can add up to 45 days pay for every year of service when an employee is dismissed for other than justifiable cause under the law. When a worker resigns, his termination payments are less, but still amount to 15 days pay for every year of service.

Then there are the community services in the oil-operating areas which are a big indirect benefit to oil workers. The labor law requires that oil and mining companies, as well as others in isolated locations, provide these services, since their operations are in remote parts of the country where workers could not find nor readily develop their own housing, schools, medical facilities, shopping centers, restaurants, and recreational outlets. These have been developed in the oil fields and at refining centers over the years to the point where they represent populous, well established oil communities, and major investments and operating responsibilities for the companies. As they have grown, these company communities have attracted sizeable numbers of outside merchants, professional people, and service tradesmen to locate their businesses and set up their homes in the open areas adjacent to centers of oil population and thus begin the development of new communities. Oil companies have encouraged such developments and, in the more stable areas, made capital available to stimulate the construction of desirable, permanent community facilities near their operations which supplement, and perhaps one day may completely replace, the original company-developed community and housing centers.

Thus we have the oil worker costing his employer something in the order of $6,000 a year in direct and indirect economic rewards for his work. In this he stands ahead of his fellow worker in most of the rest of Venezuelan industry, but he probably can take at least part of the credit for having moved the general wage picture higher over the years so that the workingmen in Venezuela's many other growing industries have benefited along with him.

Wages on so unusual a scale bespeak not only a highly stable and prosperous industry, but also a worker worthy of his hire in a business which always has been marked by rapid technological progress. This is undoubtedly true. The Venezuelan in a drilling crew, the mechanic, and the refinery operator have tough, responsible jobs which call for skill and a lot of job knowledge. In many cases the working and climatic conditions surrounding them do not make their jobs any easier.

But it has been no bed of roses for the industry to bring its work force to this point or, so far as that goes, to keep even with the demand for higher levels of skill and know-how. Training in Venezuela started from zero, with experienced crafts-

Leaving the work site at the end of the day.

An oil company financed construction of this school, and contributes to its operation by paying tuition for the children of its workers.

A Venezuelan mechanic at work at an oil installation.

men and foremen from the United States teaching young Venezuelans the ropes on the drilling platform and in the shop. It has now progressed into a highly organized pattern of individual development stemming from orientation and induction for the new workers and including specialized classroom and practical group instruction before and after the man is on the job.

Training in Venezuelan oil, as elsewhere, has gone right up the line through every part of the organization. The job is not only the traditional effort to improve men in their present work, and to give everyone a chance to move along in the organization, but it is superpowered to make possible the operation of the industry by Venezuelans at the highest possible levels, in as many specialized functions as possible, and at the earliest possible date.

Management training has been a big part of this job because the better educated Venezuelans for decades have been more attuned to the professions and to family-type businesses than to the management of complex industrial organizations. The foreign-service engineers and technicians also have needed a broader outlook than their professional training has provided. Making good managers out of skilled technicians has thus been a complicated job in Venezuela. One current approach to this problem is the broad-scale use by one of the oil companies of a university-type advanced management course, with the Stateside University sending the faculty and much of the material to Venezuela for seven three-week programs in the course of one school year. Thus, this year more than 200 of the company's top managers, both Venezuelan and American, will receive training similar to that received by only a select few in most USA companies. Along with them, a handful of businessmen from outside organizations in Venezuela have also received this training.

Looking now to the long-range development of professional and managerial talent, great numbers of bright young Venezuelan men and women—some of them oil-com-

A church which has risen as part of a new open community near oil refineries on Paraguana peninsula.

pany employees and others just leaving school and college—have been sent on for further education at the undergraduate or graduate level at the expense of oil companies. Many of these investments in oil's future manpower are on campuses in the United States and in Venezuela at this moment, and the number is growing. As more oil companies move into Venezuela following last year's granting of new concessions, the need for highly qualified local talent to run the companies is going to be even more acute than it has been in the past, and training and education can be expected to receive even more attention.

Much of the pressure by USA oil companies to train Venezuelans in the professional and management fields is just good business and sound economics. It costs a great deal less to hire, relocate, and train a Venezuelan than it does to transplant an American, Englishman, or Dutchman and his family, teach them Spanish, and then see them leave when they decide, after a few years—as a high percentage inevitably will—to continue their careers in their own country.

But the Venezuelan labor law adds a legal requirement to the picture. In both blue-collar and white-collar categories, Venezuelans must hold 75% of the jobs, and this is a separate requirement for each company in each of the states of Venezuela where it does business.

This has ceased to be a problem for oil companies in the wage-earner category. Most oil companies are nearly 100% Venezuelan-manned in this group, even in the most demanding skilled-labor classifications, and there is an ample labor supply for development under the oil companies' programs to meet future needs. The numerical preponderance of wage-earning employees brings the overall percentage of Venezuelans in the industry up to the 90% mark.

It is in the white-collar group that close attention to the 75% requirement is necessary. Although there is now an adequate supply of Venezuelan clerical and stenographic talent—and these help to boost the percentage—it is more difficult to fill the technical and managerial jobs without using a large number of foreign-service personnel.

For one thing, the requirement for professional, technical, and management manpower is constantly growing, and is well in excess of 5,000 today in the oil industry. For another thing, oil must compete, for the limited supply of qualified Venezuelan talent, with the government, with the construction trade, and with the many other new industries growing up all over the country. These not only attract new college graduates, but also represent a lure to some of the experienced men the oil industry has trained.

Until recently the supply of new college graduates within Venezuela in categories most useful in the oil industry has been just a trickle. There have been large classes of civil engineers—professional men needed to push the nation's burgeoning programs of public works, highways, utilities, commercial and residential construction. But only a year or so ago did the first Venezuelan petroleum engineer graduate at a Venezuelan university; and, although the number is growing, just a handful of geologists, and chemical, mechanical, and electrical engineers graduate each year from the five universities in the country. Vigorous long-range programs, supported by industry, are now working to show Venezuelan secondary-school students the worthwhileness of pursuing a college education in fields related to the oil industry.

Meanwhile, the largest supply of technically trained Venezuelan manpower has come from the men taking their schooling in the United States. It is estimated that more than 1,200 Venezuelans are attending college in the USA today, and the figure has been growing each year. Many of these are on industry-sponsored or government scholarships; others are on their own. But each represents a rich educational investment in the future of his country as well as his own personal opportunity.

Oil particularly represents a great career opportunity for the Venezuelan who can prove himself as a technician and a man-

Venezuelans and North Americans attend an advanced management course given by an oil company in Caracas.

American and Venezuelan design engineers work together.

ager. The companies look to Venezuelans first in hiring—giving a valuable opportunity at the start. Then, in competition with the foreign-service employee for promotion, the Venezuelan is given every facility at his employer's disposal to equip himself for a better position. (The foreign-service employees, too, are offered these facilities.) The point is that Venezuelans can go, and have gone, right to the top of the largest of Venezuelan foreign-owned oil companies, and this is certain to be increasingly the case in the future.

This is the training and educational picture, and it's a big part of the overall manpower problem affecting oil companies in Venezuela today. But many other programs common in the domestic industry have been adopted to build productivity and motivation, to bring the Venezuelan labor force up to a par with the finest in the world. Safety, for one, has received great attention in recent years. In the early days of oil in Venezuela, no one was satisfied with the record of the industry in keeping its people safe on the job. The jobs were tough, the surrounding conditions were difficult, and workers were untrained. Today that picture is changed radically. Whether on Lake Maracaibo or in the lowlands of eastern Venezuela, the oil worker today is protected by every method and facility at the industry's disposal. And the record is good—safety statistics of many companies comparing most favorably with those for similar operations in the United States. Continuing promotional campaigns and safety training programs have made the Venezuelan worker highly safety-conscious. Safety engineers, major investments in protective equipment, and sustained safety programs have made it possible for him to be well protected on the job.

Other more sophisticated aids to productivity have also been moving into the picture gradually, including advanced research, the psychological and aptitude testing for improved placement and appraisal of employees at all levels, and broad programs of employee communication to keep information flowing up and down between top managements and their wage earners.

What about unionism in Venezuela? Today almost every worker in major industry in the country, and certainly every one in a major oil company, is covered by the terms of a collective contract negotiated by a union or a federation of unions.

Contracts in the oil industry, and to a lesser extent in others, have been for long terms with no reopeners—the most recent oil contract having been negotiated for three years from 1956-59. It was hammered out in several months of industry wide negotiations between representatives of all of the oil companies and of the union confederation who spoke for most of the nation's unions of oil workers. Negotiations were conducted at the Ministry of Labor under the watchful eyes and ears of government officials. They were tough, give-and-take negotiations, as they always have been, but were run off in a businesslike, orderly fashion. There is every reason to believe that in this contract, as in past ones, the terms as agreed to will be adhered to closely by both sides.

In looking after the interests of workers from day to day, Venezuelan unions have been alert to represent them in grievances and claims of improper application of the labor law or collective contract. Regular grievance procedures are followed throughout most of the industry; but, in any event, a worker and his union have recourse to labor inspectors set up in local areas throughout the country, and to labor courts.

All of these present conditions in the Venezuelan oil-labor market, from compensation and benefit patterns to the relationships between companies and unions, are a result of the history since 1935, and some understanding of that history is necessary to evaluate the picture today.

In 1935 there was virtually no labor or other social legislation. Both labor and political organizations were strongly repressed. Following the long dictatorship of General Gómez, a new government was formed in 1936. In reaction to the oppression of the Gómez regime, a more enlightened approach to social problems was adopted and a modern labor law came into being almost overnight. This law is the key to much of the subsequent development of industrial relations. The law has been modified from time to time, but the original remains the general basis for the conduct of business in its relationships with its people.

Perhaps the most significant aspect of the law is that it contains specific benefit and working-condition provisions such as have been developed only over many years of negotiating in other countries. Thus, collective bargaining in Venezuela has served to supplement the law, while in many countries labor laws have served to formalize and make generally applicable the benefits gained by some segments of workers after years of bargaining. For example, the law specifies the length of vacations, sets forth termination benefits, profit-sharing bonuses, and many categories of premium pay in great detail. The law also provides for the recognition of unions of both workers and employers if they meet reasonable legal requirements. As already noted, the law requires industries which operate ordinarily in isolated areas to provide a great variety of community services to be furnished by the employer—particularly housing—but also covering medical care and educational facilities.

The advent of this law quickly set a solid base for the establishment of working standards and the relationships between unions and employers. But it took some time for the situation to shake down to one of complete stability. However, for some years now, bargaining has gone forward through negotiating periods in which benefits have been gained on top of the basic platform of the worker's privileges called for in the labor law.

The role of the government in these negotiations, and in its continuing interest in labor relations, cannot be minimized. Although anxious to have the unions and companies work out their own problems—and explicitly expecting them to do so—the Ministry of Labor has kept in close touch with all developments, and has often exerted the influence of its suggestions in negotiations and disputes.

Over the long run, there has been little basis for anyone to gauge the activities of the government in labor relations as unduly favoring either management or labor. Instead, it is readily apparent that the government is keenly aware of the key role of petroleum in the national economy, and that one of its prime governmental responsibilities is to keep the industry and its workers on an even keel. A tremendous proportion of the government's income is derived from oil profits, to the tune of approximately $700 million a year. It is from this income that much of the impressive national progress in transportation, education, health, and other public-welfare areas has been financed. Any loss of this income would represent a serious problem for the government. Either protracted labor unrest or oppressive labor costs could quickly move the Venezuelan oil industry into a noncompetitive position in world oil markets. On the other hand, the oil worker is the bellwether of the laboring man across the country, and he too has expected continuing progress. The government has indicated on many occasions its expectations that negotiations would produce continuing economic growth for the industry's employees, and that the individual workingman would be handled with scrupulous fairness under the law and the contract in effect. In short, the government has looked for stability in the internal operation of the oil industry so that, without interruption, it could move forward on the economic front. It has acted as a moderator, but as a quite forceful one—not fearful of making its influence felt if its basic objectives were in jeopardy.

We have, then, the traditional and historic desire of the worker for security and opportunity well served in Venezuela. He is secure in the solid phalanx of labor law, established unionism, and government policy which, so long as there is economic progress in his country and his industry and he makes his fair contributions to it, he will be well protected. This is true on paper, and it has been notably true in practice for the Venezuelan oil worker. But it is in opportunity and growth that the real bonanza lies for this man. With more and more employers seeking the great natural wealth of the country, with a favorable investment climate for economic growth, there is hardly any limit to the potential growth of Venezuela's people. These gains are only nominal compared to what he can look to in the future, as better education and modern standards of industrial relations make it possible for the Venezuelan to play an increasingly larger part in his nation's development, and gain a correspondingly greater reward. END

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– M. J. Rathbone, President, Standard Oil Company (New Jersey)

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LEGAL and FISCAL ASPECTS of ENGAGING in the

Venezuelan exploration crew (Creole photo).

The Venezuelan oil law is one of the most successful and influential in the world. Under the law the nation owns the subsoil, and may grant concessions therefor. Production concessions may be received over half the exploration area. The income tax amounts for oil to half net income after Venezuelan taxes, a provision which has spread to many other countries.

OIL BUSINESS in VENEZUELA

by J. S. McClendon

Venezuelan oil and animal husbandry, La Salina district.

THE recent award of additional concessions by the Venezuelan government to explore for and produce oil and the prospect of further grants in the future have stimulated interest in the various governmental regulations applying to oil companies in Venezuela. These regulations do not differ greatly in nature from those under which oil companies operate in other parts of the world, but do differ in degree. The space allotted will permit only a brief outline of the subject and necessarily leave many questions unanswered, but it is hoped this discussion will give an understanding of the basic problems. Where comparisons are necessary, practices in effect in the United States will be used.

In Venezuela, as in most countries outside of the United States, mineral rights are owned by the sovereign, i.e., by the nation. This, plus the fact that through taxation the nation receives a large share of the profits of the oil industry, creates a community of interest between the nation and the industry in the economically sound development of the petroleum resources of the country.

The basic statute relating to petroleum is the Hydrocarbons Law passed in 1943, still operative in its original form except for a few relatively unimportant amendments made in 1955. This law, by its terms, governs all aspects of exploration for and production of hydrocarbons and the manufacture, refining, transportation, storage, and handling of such substances, except marketing, and declares all such operations to be in the nature of a public utility[1].

The law authorizes the national executive (herein called "the Executive") to conduct the various operations covered by the law or to grant concessions to conduct them to any person or company, Venezuelan or foreign, which has the capacity to contract[2], with the following exceptions: foreign corporations must qualify to do business in Venezuela to be eligible; and foreign governments, including government corporations, and certain Venezuelan officials are prohibited from acquiring concessions[3]. Any such eligible "person" may conduct surface exploration, including drilling to a depth of 100 meters (328 ft), without a concession but after notifying the Ministry of Mines and Hydrocarbons[4]. (References to this ministry will be abbreviated to "the Ministry" or "Ministry of Mines.") The regulatory ministry originally was the Ministry of Development (*Fomento*), but was changed in 1951. Of course, consent of the owner of the land must be obtained prior to entry, subject to procedures for compelling entry which will be discussed later. The Executive has the right to prohibit unrestricted exploration in any area.

Concessions: There are four types of concessions: exploration-exploitation (herein called "exploration"); exploitation (herein called "production"); manufacturing-refining; and transportation. The rights and obligations of the latter two types are included in the grant of exploration or production concessions[5]. Exploration and production concessions give the concessionnaire no title to hydrocarbons in the ground, but the rights granted by these concessions are real property and may be mortgaged[6]. In addition to the various taxes and obligations provided in the law, the Executive is

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*Petro-Tech Service, C. A.
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Schlumberger Well Surveying Corporation
Schlumberger of Canada
*"Schlumberger" Surenco, S. A.
Schlumberger of Latin America, S. A.
Schlumberger Overseas, S. A.
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Trinidad Oilfield Service Limited
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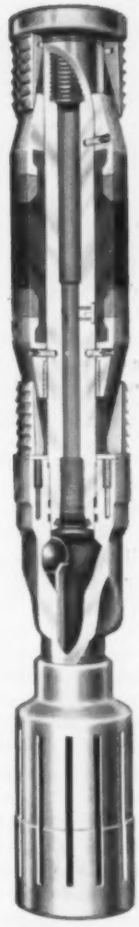

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authorized to require of an applicant special advantages to the nation[7]. In the recent and current invitations to bid, such special advantages have included: an additional 8% production tax if the crude is refined outside Venezuela, but in the Caribbean area; an obligation to refine in Venezuela the equivalent of 15% of crude produced from the concession; a bonus in the form of additional initial production tax or first annual exploration tax; the obligation to take exploration concessions in Colombian border areas along with more desirable concessions; and the obligation to cooperate in the conservation and utilization of natural gas including delivery to the nation, upon demand, of the equivalent of 16 2/3% of gas destined for injection into a reservoir. Some bidders have also agreed to pay a higher rate of production tax than required by law, or have offered other special inducements.

Exploration concessions are granted in "lots" not to exceed in area 10,000 hectares (24,710 acres)[8]. The concessionaire has the right to conduct all types of exploratory work for three years, subject to the rights of the owners or occupants of the land over which the concession is granted[9]. During this period the concessionaire must survey the lot, and may subdivide not more than half its area into rectangular production parcels which may not exceed 500 hectares (1,235.5 acres) each. He may then request that production titles be issued for any of these parcels. The area not selected reverts to the nation, and is known as "national reserves[10]." If the survey shows a greater area than granted in the exploration concession, the excess is called *sobrante*[11].

Creole exploration in Venezuela.

Production concessions[12] may be granted over national reserves and *sobrante* areas after publication of a resolution by the Ministry specifying the areas involved, upon receipt of sealed bids. The owner of the concession from which a *sobrante* area is taken will be preferred in the award of a concession over that area if his offer meets the offers of others [13].

Theoretically, anyone may apply for production concessions over any other area upon a mere petition describing the area, accompanied by a sketch map. However, the practice has been for the Ministry to issue informal invitations to bid for specified lots; and, after informal notification of the award, the successful bidder makes his official application for a concession. This same procedure has been followed with respect to exploration concessions.

The Ministry approves concession maps by resolution published in the *Official Gazette*. If there are no objections thereto within 30 days, the resolution becomes final, and a title is issued[14]. Production concessions have a life of 40 years from the date on which the resolution approving the concession maps becomes final. The concessionaire acquires the exclusive right to produce hydrocarbons within his concession boundaries and use them. In the exercise of this right, he may construct the necessary buildings and facilities—including telephone lines, means of transportation, and wharfs—and he may generate needed electric power[15].

There are two ways to extend the duration of production concessions: Between the 20th and 38th years thereof the Executive is empowered to enter into an agreement with the concessionaire to extend the concession by granting a new term of 40 years from the date of the agreement. In such case, a special yearly tax of 0.20 BOLIVARES (US $0.076) per hectare (US $0.0307 per acre) is incurred for the period by which the original term is extended. Under the second method, in the next to the last year of the term, the owner of a concession in commercial production may apply for a new grant of the concession. The Ministry will publish the conditions under which the new grant will be made. The former concessionaire will be preferred in the grant of the new concession if he meets the specified conditions. At the expiration of a concession, it reverts to the nation, without indemnity, including all permanent construction thereon[16]. Concessions may be renounced at any time upon payment of taxes then due[17].

Refining and transportation concessions may be granted apart from production concessions, in which case they have a life of 50 years and may be renewed for like periods as long as operations continue[18]. Pipelines are common carriers to the extent that they have excess capacity, and tariffs must be approved by the Ministry[19].

Exploration and production concessions may be transferred to any person or company not prohibited from holding concessions, provided written notice thereof is given to the Ministry and provided, further, that the consent of the Ministry must be obtained if the transferee holds more than 300,000 hectares (741,300 acres) of exploration or 150,000 hectares (370,650 acres) of production concessions. Other types of concessions may be transferred if notice is given to the Ministry[20]. Such transfers are valid only if the transferee assumes all the obligations of the transferor vis-a-vis the nation—although both parties will be jointly and severally liable for taxes owing on the date of transfer[21]. (*Note:* Since the balance of the article relates primarily to holders of production concessions, when the word "concession" or "concessionaire" is used hereafter, it refers to a production concession unless otherwise indicated.)

Fiscal Matters: As is the case elsewhere, oil companies are subjected to a variety of taxes in Venezuela. On the other hand, there are very few private overriding royalty agreements in Venezuela, and these have arisen out of concession transfers. However, such a royalty gives the owner virtually no rights until oil is produced, and he cannot force the concessionaire to drill even to prevent drainage.

The Hydrocarbons Law imposes a surface tax, a production tax, a consumption tax, and a transportation tax. The Income-Tax Law imposes a 2 1/2% basic (*cedular*) tax, a graduated surtax (*impuesto complementario progresivo*), and the so-called 50-50 or additional tax. The Fiscal Stamp Tax Law imposes a 5-mil gross-receipts tax. There are also import duties. These levies will be taken up in order, but first a word about currency and exchange regulations.

Venezuelan *bolivares* are generally considered to be as "hard" as any currency in the world. The current rate of exchange with USA dollars is bs. 3.33 per dollar, if selling dollars and buying *bolivares* (bs. 3.35 per dollar if buying dollars with *bolivares*). However, for a number of years the oil companies have been required to sell foreign exchange acquired from export of hydrocarbons or other activities to the extent of their needs for *bolivares* to the Central Bank (Banco Central de Venezuela). A decree to this effect, affirming the then current practice, was issued in 1944[22]. By agreement between the Central Bank and the Finance Ministry (*Hacienda*) to which the oil companies are not parties, such foreign exchange is acquired in USA dollars at the rate of bs. 3.09 per dollar. (Conversions may be made, in this article, by multiplying *bolivares* by USA 32 cents.) Moreover, if the Central Bank is unable during any year to sell all the dollars it has acquired from the oil companies, the price for such remainder is recomputed at the gold-import rate of about bs. 3.04 per dollar[23]. All this makes oil-company *bolivares*

cost about 8% more than those acquired by other persons. As a general rule, debts incurred in Venezuela by the oil companies are paid in *bolivares;* but, as a matter of practice, obligations for goods and services acquired outside of Venezuela are paid in the currency in which incurred as long as payments are made outside of Venezuela.

Exploration concessions are subject to an annual tax of bs. 2.00 per year per hectare ($.0259 per acre) or fraction thereof[24]. On the acquisition of a production title, an initial production tax of bs. 8.00 per hectare ($1.036 per acre) is imposed[25]. However, in the recent bidding, additional sums as first annual exploration tax or initial production tax have been required as special advantages. Bonuses as high as $2,832 per acre have been paid. A so-called surface tax is also levied on production concessions. This amounts to bs. 5.00 per hectare (64 cents per acre) per year for the first five years, increasing bs. 5.00 every five years thereafter until it reaches bs. 30.00 per hectare ($3.88 per acre). This tax is assessed quarterly. If a production tax is being paid on a concession, the quarterly amount of the surface tax is reduced by the amount of the former tax to a minimum tax of bs. 1.25 per hectare (16.2 cents per acre) per quarter[26].

There is a production (*explotación*) tax (sometimes, and erroneously, referred to as a royalty) of 16 2/3% of crude oil[27] or natural asphalt produced[28] and natural gas sold or used as fuel[29]. The tax is payable in kind or in cash at the option of the Executive. Three months' notice of change in the method of collection must be given by the Executive[30]. As a matter of practice, the tax has usually been collected in cash. Crude oil is measured at gauging stations in the field, and the tax is based on the market value at that point. The law authorizes the Minister to enter into agreements as to the market value of the hydrocarbons produced, subject to certain limitations. A table of minimum values is included in the law, running from bs. 13.20 per cubic meter ($0.68 per barrel) for lower than 18 API gravity oil to bs. 22.95 per cubic meter ($1.18 per barrel) for 42 API gravity and over. And no more than bs. 0.005 per cubic meter per kilometer may be deducted for pipeline or other transportation between the field and deep-sea port of easiest access[31]. The present agreement between the Executive and the oil companies ties the value of Venezuelan crudes to the prices posted for several grades of crude and fuel oil in the USA Gulf. USA import duties on crude exported to the USA may be deducted. Most companies are now posting crude and product prices fob Venezuelan ports, but these prices have not yet been accepted for the purpose of valuation for production-tax purposes. The values under the present agreement are generally higher than posted prices.

Valuation of natural gas for tax purposes is based on the sales price if sold, or upon the value of the calorific equivalent of crude oil if consumed in operations. Gas

Seismic exploration in Lake Maracaibo (Creole photo).

flared with approved burners, or returned to the reservoir, or used to stimulate crude-oil production, is not subject to tax[32]. Efforts are being made by the Executive to reduce the amount of flared gas. For example, to provide for utilization of the associated gas from eastern Venezuela fields which is in excess of pressure-maintenance requirements and the small needs of industry in the area, the National Petrochemical Institute, a government corporation, is building a 250-mile pipeline to bring the gas to the industrial and population centers in west-central Venezuela. The institute is also building a petrochemical plant near Puerto Cabello.

Where natural gas is processed in natural-gasoline or similar plants, the Minister is directed by law to determine the share thereof belonging to the nation[33]. The type of contract currently in vogue provides for a tax of 16 2/3% of the value of the products of the processing plant. To determine value, deduction of part of the costs of manufacture—including 10% annual depreciation, 10% of direct costs and depreciation for administration, and 6% annual interest on the undepreciated balance of the investment—is allowed. If the product is returned to the crude stream, the ordinary production tax is paid on the mixture after deduction of part of the cost of manufacturing such product[34].

The Executive is authorized to reduce the tax to stimulate production where otherwise uneconomic, or to reduce or cancel the tax on natural gas used for purposes considered to be in the public interest, such as supplying gas to municipalities[35].

If locally refined products are used or sold for consumption in Venezuela, there is a so-called consumption tax on manufacturers and refiners equal to 50% of the import duties, if any, which the manufactured product would have incurred had it been imported. This tax is not payable, however, on such products if used by the concessionaire in his own producing or manufacturing operations[36]. Examples of such duties are: motor gasoline, 85-octane and higher, bs. 0.041 per kilo ($0.037 per gallon); aviation gasoline, high-octane, bs. 0.0205 per kilo ($0.018 per gallon); lubricating oil, bs. 0.20 per kilo ($0.224 per gallon); grease, bs. 0.20 per kilo ($0.029 per pound); heavy fuel oil or gas oil, bs. 0.002 per kilo ($0.002 per gallon).

There is also a tax of 2 1/2% of receipts from third parties for pipeline transportation[37].

The Venezuelan income tax[38] dates from 1943. The present law went into effect on January 1, 1956, but did not greatly change the existing rates or principles. Since taxable income for basic tax purposes is almost the same as that used for computing the surtax and is the starting point for computing the additional tax, the principles for determining the basic tax will be outlined, followed by a brief discussion of the manner of arriving at the other two taxes. Slightly different rates of basic tax apply to various types of enterprises. However, the rate is the same (2 1/2%) on both general business activities[39] and income from operation of mines and hydrocarbon reservoirs and related activities[40]. Except as otherwise stated, however, this discussion will be limited to the tax on petroleum activities.

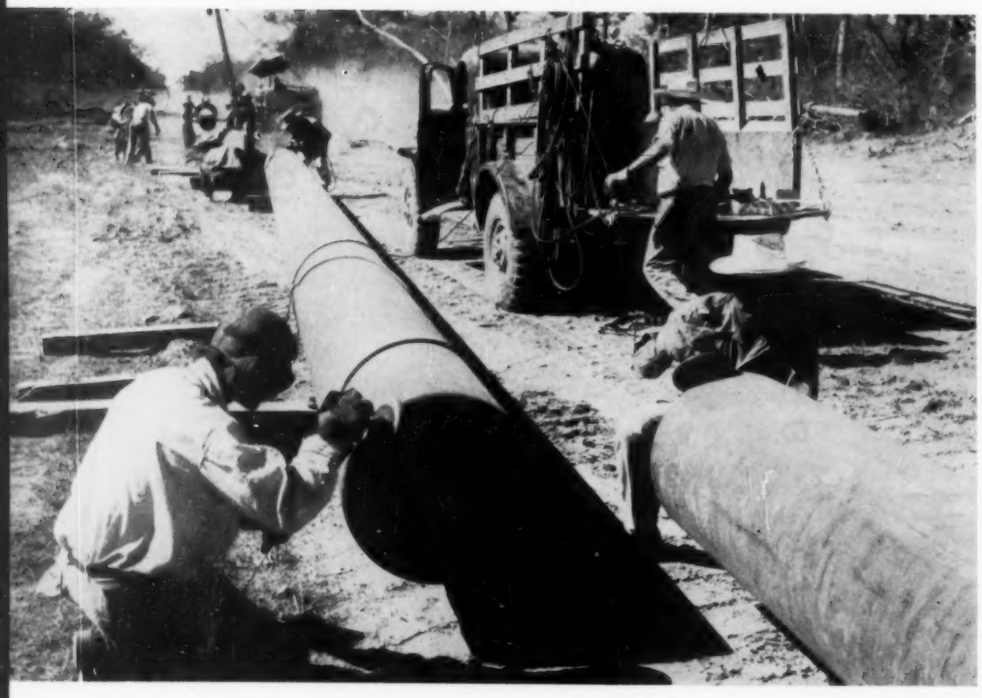
In general, only income having a source in Venezuela is taxed[41]. Income includes capital gains[42], but dividends received are exempted from tax[43]. The law authorizes regulations to fix the procedure for determining taxable income from activities

(Continued on page 154)

BARINAS OIL SEARCH REWARDED

With completion of a 212-mile pipeline to the coast, two pioneer companies in the Barinas area of Venezuela, Sinclair and Socony, will begin to recoup the expenditures incurred in 47 years of work. Barinas is a classic example of the long time lag which must interpose between exploration and production. The oil's development will be a major shot in the arm to a relatively backward area.

Preparing 20-in. pipe for welding on the Barinas-Puerto Cabello pipeline now nearing completion (Photo courtesy of Sinclair Oil and Refining Co.).

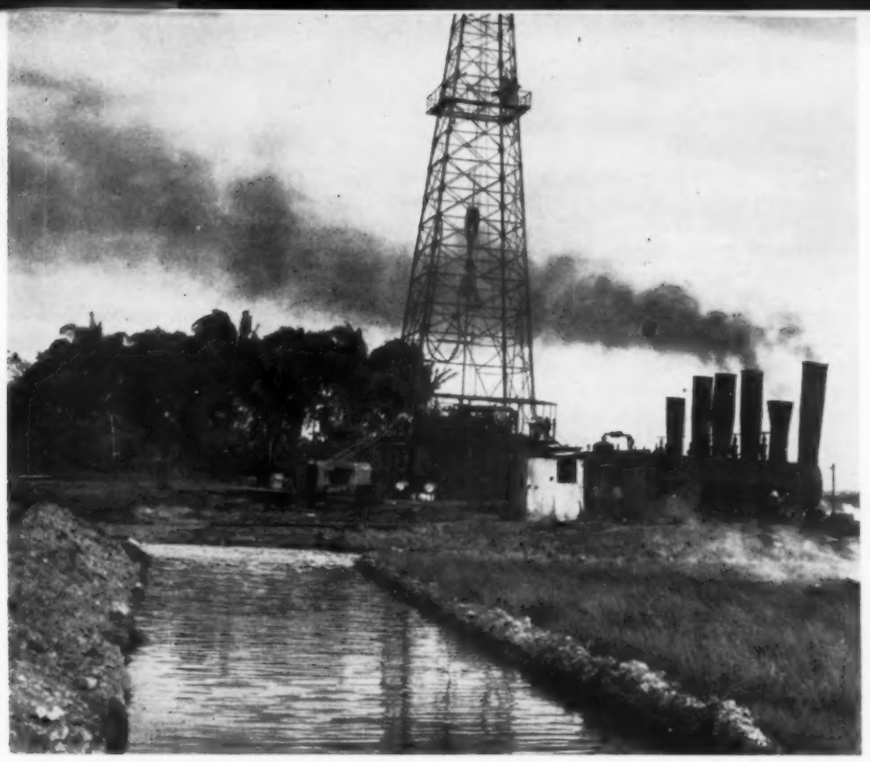


WHEN the 20-in. 212-mile Barinas-Puerto Cabello pipeline is placed in operation this fall, a significant chapter in the history of petroleum pioneering will have come to its conclusion. The two participating companies, Socony Mobil Co. de Venezuela and Sinclair Oil and Refining Co., have pioneered in the area since 1941 and the mid 20's, respectively. They have discovered three fields so far, and their investment in the pipeline, about $25 million, shows the faith they have in finding more oil in the area.

The three fields found to date are all located in the state of Barinas, in Venezuela's western llanos, southeast and within a 26-mile radius of the town of Barinas. Socony Mobil de Venezuela is credited with the first two discoveries, Silvestre in 1947 and Silvan in 1949. In 1953 Sinclair brought in its Sinco field, some four miles south of Silvestre. Terrain included within the state of Barinas consists chiefly of flat grassy lowlands, bounded on the northwest by the high Andean range and lying between the Guanare and Apure Rivers. Numerous heavily wooded streams, with head waters in the mountains, flow southeastward across this region, and empty into the Apure River.

During the dry season, roughly December to May, there is little rainfall; the rivers are easily forded, and motor travel is possible over most of the area even where no roads exist. During the wet season, traffic is confined to the few surfaced roads in the vicinity of the oil fields and the town of Barinas and to the good government highways, built in recent years, which connect the area with the Andean interior and northern coastal cities. While the yearly rainfall averages only about 60 in., owing to the flatness of terrain, heavy grass cover, and heavy jungle, much of the area becomes covered with water for months at a time. In spite of these difficult operating conditions, the companies have been working in the Barinas basin for many years. When Socony began operations in 1941, Barinas was a semi-isolated town with a fence around it to keep cattle off the streets, and it was soon necessary to build a company camp. By the end of 1944, this camp was headquarters for several hundred employees. During the war, supplies of all kinds were extremely scarce. Deliveries were often delayed for months; and, in order to maintain any satisfactory degree of efficiency, it became necessary to undertake a rather extensive warehouse operation. Further, actual delivery to Barinas posed serious problems at times due to flooding rivers, and airplanes were used regularly to bring in food, other critical items, and personnel. Once during 1944, even gasoline for cars and trucks had to be brought in by air.

Sinclair or its predecessor companies have been interested in the Barinas basin since the middle 1920's. Early geological work was confined to the foothills area of the Andes for a determination of the anticipated stratigraphic section present in



View of Sinco 15 field, with drilling well, Barinas (Photo courtesy of Sinclair Oil and Refining Co.)

the basin itself. In 1926 and 1927 exploration rights on something over 9,000,000 acres were acquired in the states of Apure and Zamora (now Barinas). They have been reduced over the years, and the company now has a total of 618,000 acres in Barinas.

Refraction seismograph surveys were carried out by Sinclair as early as 1930 and 1931; and rather extensive tortion-balance, magnetometer, and soil-analysis surveys were made during the middle and late 1930's, together with some reflection seismic work. Sinclair has been doing reflection seismograph work in the basin almost continuously since 1943, largely confined to the five or six months of the dry season each year, but in some cases working through the wet season also.

The first well ever to be drilled in the Barinas basin was drilled by Sinclair northwest of the town of Barinas, and completed in 1931 at a total depth of 5,525 ft. Required depths exceeded the capacity of the rigs employed, so the well did not reach its objective and was abandond.

In 1953 Sinclair's Sinco No. 1 discovered the Sinco-15 field. Development work by Sinclair in this field has been carried on continuously since that time, and currently Sinclair has 26 completed oil wells in the field awaiting a pipeline outlet.

By the middle of 1947, Socony had completed five deep wildcat wells and a sixth (Silvestre-2) was drilling below 9,200 ft. The first five wells—Yaure-1, Yaure-2, San Vicemte-1, Silvestre-1, and Calzada-1—were dry holes and abandoned. Discovery of oil was made in the sixth well, Silvestre-2.

Each of these wells required its own camp, complete operating equipment and supplies. The chief problem was transportation. For the first well at Yaure, this amounted to 24% of the total cost, or approximately $215,000. Similar high costs were experienced in the drilling of the other wells. As an example of the difficulties encountered, the road to the Calzada well was impassable during most of the 1946 rainy season; and, for a number of months, all personnel, food, and smaller materials were brought in by the company airplanes. In one instance, it was necessary to fly in a string of 4½-in. drill pipe.

Three of the earlier wells were drilled with a diesel rig barged up the Orinoco and Apure Rivers from eastern Venezuela. Later wells were drilled with equipment hauled 431 km (268 miles) by road from Puerto Cabello. Trucking rates from Puerto Cabello to Barinas in 1947 were normally about $67 per ton, as compared with the current rate of $28.

On August 2, 1947, Silvestre-2 came in producing 28-API-gravity oil at the rate of 1,200 b/d from an interval below 9,200 ft. Low pressure and low gas-oil ratio indicated the crude was undersaturated. Additional drilling and seismic work was done to outline the producing area: and another higher sand, around 8,600 ft, was found productive in some of the wells.

In 1949, Silvan-1, the discovery well in the minor Silvan field, was completed. This was a single-zone well in a sand below 10,500 ft with similar characteristics as the Silvestre wells. Silvan-2, the only other well drilled, was a dry hole.

Although encouraged by these discoveries, Socony was faced with the difficult job of determining whether reserves were sufficient to justify the high cost of getting this crude to tidewater. In view of the low reservoir energy, considerable laboratory work and field experiments were undertaken to determine the best method of obtaining maximum ultimate recovery. During this time, drilling activity was curtailed —although seismic work, in the form of reinterpretation of existing data as well as field surveys, continued.

While the laboratory studies were being carried out, aerial photo surveys were made of the most likely routes for a pipeline. There were three possible routes for a line: 1, across Venezuela to Puerto La Cruz, in eastern Venezuela; 2, across the Andes to Maracaibo; 3, northeast from Barinas to Puerto Cabello.

The first route was discarded as being too long, and the terrain was unsatisfactory. The second route had the advantage of terminalling at established facilities in Lake Maracaibo, but crossing the high Andes presented a number of problems. A number of booster stations would be required.

The third route was selected as most satisfactory. There were no tanker-loading facilities available at Puerto Cabello; but there was an excellent harbor which could handle tankers, and marine repair and service facilities were available. Puerto Cabello also offered advantages in that it was one of the fastest growing centers of industrial development in Venezuela. Accordingly, in 1948, work of surveying the right-of-way was started and acquiring land rights was begun in 1952.

Following the laboratory investigations on producing methods for the Silvestre-Silvan fields, the first order of business was to recomplete a number of the early wells as observation wells and to recomplete Silvestre-4 as a water-injection well. This work was carried out in 1954. Since 1954, a pilot water injection has been in operation. No definite conclusions have been possible to date, and a number of mechanical problems of the type expected in high-volume floods of sands below 9,000 ft have been encountered. A great number of these problems have been overcome, but a few still remain.

Much of the drilling during 1954, and 1956 was carried out to prove productive limits of the Silvestre field and to aid in checking structure revealed by seismic work. This drilling was carried out with one rig. By the middle of 1956, the development program had been selected and the remainder of the locations required for field development were staked in order that roads required to maintain year-round rig operation could be prepared in the dry season. Three rigs are now active in Socony's Silvestre field.

Gathering System: After finalization of the development program, it was possible to decide on the gathering system which would collect the oil in the most economic manner.

The Silvestre field is unique in that the productive limits have been largely determined before oil-production facilities were needed. This made the area a prime candidate for automation. The Petroleum Engineering Department undertook automation studies, and devised a scheme which should allow the maximum amount of production information to be gathered at minimum cost.

Past experience in other Socony operating areas in Venezuela has shown that un-

attended substation gathering systems are highly practicable. In this type of gathering system substations are located in the center of groups of wells in order to allow optimum flow-line length, and the oil is produced into separators at the substations. This system usually allows two-stage separation with a high enough pressure being maintained on the final stage separator to force the oil into a large trunk line which connects several substations to a central fiscalization point. Low-pressure wells, and wells being tested, are produced into a low-pressure separator, and any discharge from emulsion treaters is injected from the tanks into the trunk line by means of a blow-case which works on automatic controls governed by fluid level in the tanks.

A modification of this system appears applicable in Barinas. The low internal energy of the produced fluid, due to low gas saturation, requires that minimum back pressure be maintained on the wells. Two-phase flow calculations were used to determine that 4-in. flow lines would be the most practical size. Accordingly, two substation sites were selected in Silvestre and one in Silvan. A 10¾-in. spiral weld trunk line was selected to connect the three substations to the main fiscalization station.

The fiscalization station will be a combination production-pipeline station with four 150,000-bbl floating-roof tanks installed. Two tanks will be allotted to Socony and two to the Sinclair Oil and Refining Co. which has an initial 25% interest in the pipeline, with fuel equity to be adjusted.

Three separators will be installed in each substation—one for general production, one for well tests, and one to handle wet oil. Three 5,000-bbl tanks will be installed—one to receive wet oil, and two serving as weir tanks to measure production. When one weir tank fills, the flow is automatically directed to the other. The weir tanks are connected into a small surge tank which, in turn, is connected to three electrically operated centrifugal pumps. After a weathering period to be determined experimentally, a valve opens automatically allowing the surge tank to fill. Electrical controls in the surge tank cause the centrifugal pumps to pump the oil out of the weir tanks. The wet oil and the drainage from the weir tanks enter the wet-oil tank. The wet oil is passed through an electrical dehydrator and circulated back through the weir tanks for volume measurement. The number of times each weir tank fills will be recorded automatically.

The discharge line of the clean oil separator is equipped with a BS&W probe and a diverter valve so that, if a well being produced into the clean-oil system goes wet, the flow will be switched automatically into the wet-oil line and an alarm will sound. The treater discharge is similarly equipped; and, should the treater cease to function, the oil will be recycled. All tanks are equipped with high-level controls which will shut in the wells at the manifold before the tanks run over.

The test system will be controlled by clock, which will permit routine automatic switching of wells into the test separator. Test fluids will be metered, and an automatic sampler will take samples of the well fluid.

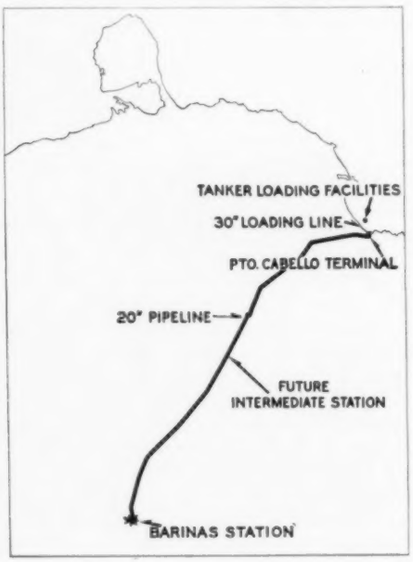
This system of gathering has been designed, and is now being purchased. In addition, plans are being made to test a bottom-hole pressure bomb which can be run and left in the well. It will record electrically to the surface, allowing bottom-hole pressures to be read merely by connecting up a reading panel on the surface.

All items to be used in the automatic system are proven pieces of equipment. In some instances, however, the application may be new. The eventual plans for the installation include possible telemetering of the measured data directly into automatic calculating machines. This should allow maximum production flexibility.

Barinas-Puerto Cabello Pipeline System: Socony's and Sinclair's new 20-in. pipeline is being laid from the Silvestre field in the state of Barinas to the El Palito terminal near Puerto Cabello in the state of Carabobo. Preliminary surveys were made with the use of aerial photographs upon which the proposed route had been selected. In general, the line follows a northeasterly direction for a total distance of 341 km (212 miles), passing through the states of Barinas, Portuguese, Lara, Yaracuy, and Carabobo.

All pipe is 20-in.-OD API grade 5L-X52 mill-tested and -inspected. The first 55.5 km of line leaving the Silvestre pump station have a ⅜-in. wall thickness, as do the 33 km leaving the proposed future booster station site near kilometer 153. The remainder of the line is of 5/16-in. wall thickness.

Except for road and major river crossings, the line is carried aboveground on concrete supports. The major road crossings are cased and buried. Dirt ramps are built over the line at unimproved road and cattle crossings. The line has been buried



at 15 river crossings because of their extreme width and/or unstable bank conditions. The river pipe is ½-in. wall, doped, wrapped, and equipped with river weights. The line is placed 2 meters below the lowest point in the river bed, to avoid damage from channel scouring, and carried at this depth to the banks where it is brought to the ground surface at the natural sag of the pipe. *H*-frames and suspension spans have been used to cross ravines and stream crossings wherever possible.

The right-of-way passed through a very heavily wooded area near the southern end where trees 2 meters in diameter and over 50 meters in height were encountered. These required dynamiting and the heaviest type tractors for removal. Because of the extremely choppy and broken terrain near kilometer 200, a great deal of earthwork was required to prepare the right-of-way for pipe laying, The next 100 km of line pass mainly through cultivated sections. The last 50 km follow the Pan American Highway very closely, hugging the toes of the northern slopes of the Coastal range. Most of the right-of-way is 30 meters wide, narrowing down to 20 and 15 meters through some sections under cultivation or proposed as future industrial or urbanization areas.

All welding is checked visually with 100% river crossing and a 30% minimum of main line welds X-rayed. The completed line will be tested hydrostatically to 1,400 psi.

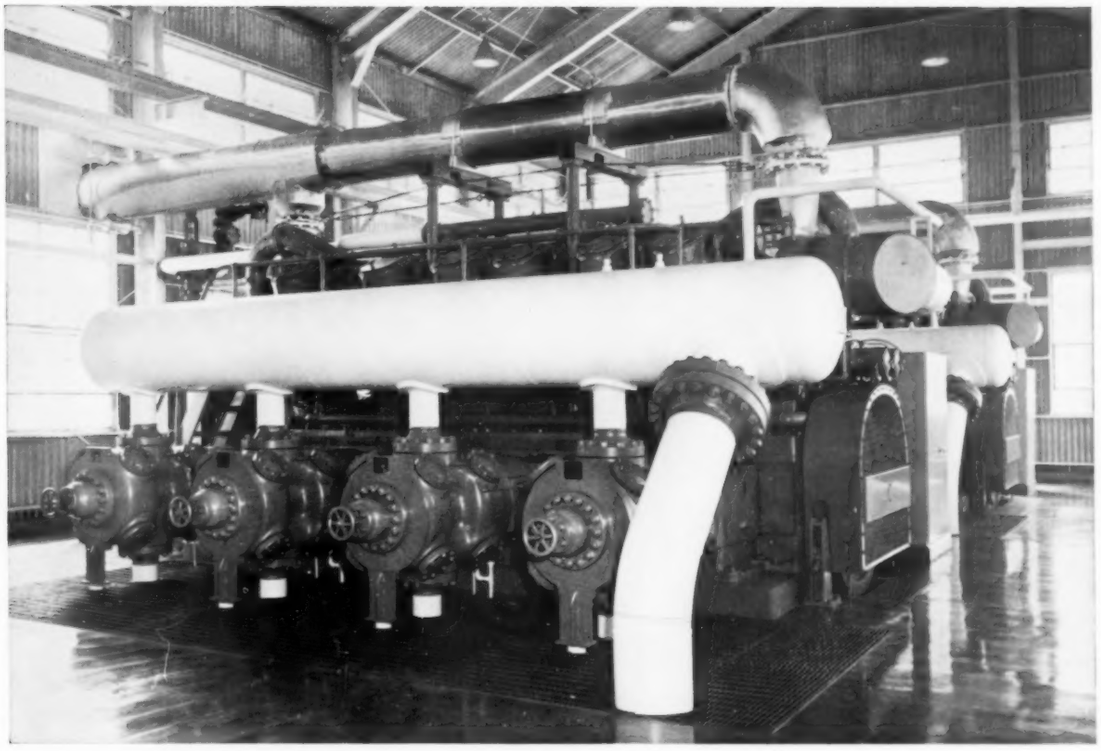
The Silvestre pump station is located at an elevation of 128 meters above sea level and will have three centrifugal pumping units driven by 2,000-hp turbocharged diesel engines at 1,000 rpm. For up to a daily throughput of 100,000 bbl, two units will be in operation at a maximum pressure of 1,200 psi—with the third unit as standby. With all three units in operation and two similar units at a possible booster station, the system can be increased to carry up to 150,000 b/d.

The Silvestre tank farm will consist initially of four standard API 150,000-bbl floating-roof tanks with a metering station for incoming oil.

The El Palito terminal will consist of five API 267,500-bbl 185-ft x 56-ft floating-roof crude-oil storage tanks located on a hilltop 80 meters above sea level. A 30-in. loading line will extend 5,200 ft from the tanks down to the shoreline, and a 24-in. line will continue 2,300 ft along the pier to the loading platform. The loading rate will be in excess of 25,000 bbl per hour.

With the loading of the first tanker at Puerto Cabello, perhaps in October of this year, the 17 years of Socony's pioneering effort in the western llanos will begin to bear fruit. Socony production is expected to begin with a rate of approximately 20,000 b/d, and this may possibly be increased to around 30,000 b/d in 1958. Sinclair's production may be of the same order of magnitude, and the 100,000 b/d pipeline will probably be carrying 50,000 to 70,000 b/d during 1958. The uncertainty over produc-

(*Continued on page* 110)



At Shelbyville, Indiana

American Louisiana installs 10,000 hp of KVS turbocharged gas-engine compressors

At Shelbyville, Indiana, in one of the three primary stations of American Louisiana Pipe Line Company, the efficiency of Ingersoll-Rand compressors and the flexibility of 4-cycle power are being applied to the task of supplying gas to utilities in Michigan, Wisconsin, Iowa and Missouri.

All of the five gas compressors at the Shelbyville station are 2000-hp Ingersoll-Rand KVS turbocharged gas-engine units. These are basically the same machines which have been setting new records since the first KVS was installed early in 1952, but incorporating the improvements which have resulted from years of tough service.

Incidentally, the first KVS (and the world's first turbocharged engine-compressor) was installed for an American Louisiana affiliate. With the forthcoming installation of six units at its new Defiance (Ohio) station, American Louisiana and affiliates will be operating 23 KVS compressors totalling 44,000 hp.

In addition to heavy-duty compressors, Ingersoll-Rand equipment for pipeline services includes rugged 4-cycle V-angle engine-generating units, centrifugal pumps, starting-air compressors, air and electric Impactools, and many other products. Ask your I-R representative how I-R can help you on your job.

Only Ingersoll-Rand Compressors have CHANNEL VALVES

Known for high efficiency, quiet operation and exceptional durability. Entirely different. Each valve is a combination of rigid stainless-steel channels and leaf springs, with trapped-air spaces which cushion action.

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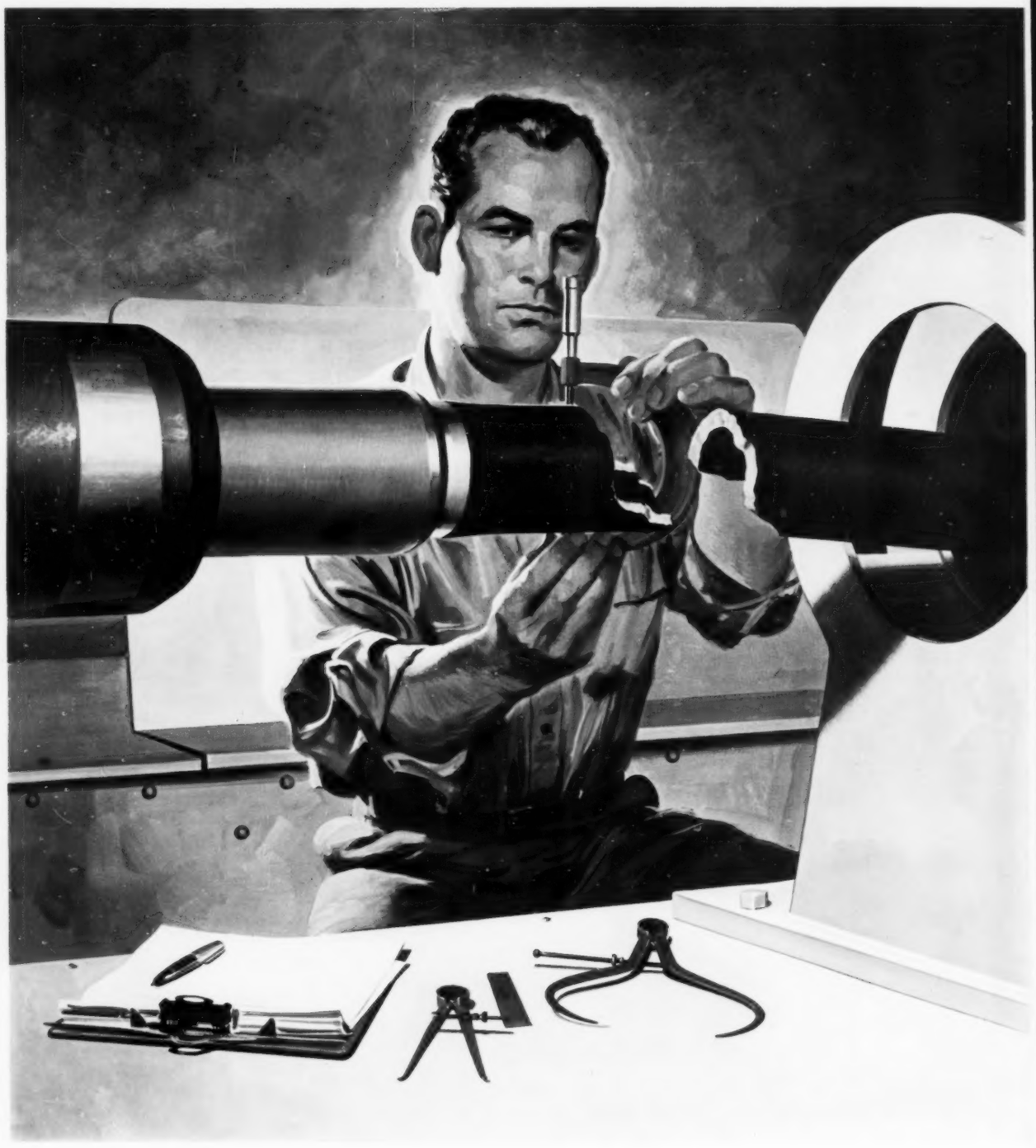


Hughes Engineering and Research Developments

1919 First heat-treated alloy steel tool joint — to make the use of tool joints economically feasible.

1929 First bucked-on tool joint with controlled torque — to minimize washouts.

1933 First bucked-on and welded joint — to prevent last engaged thread failures.

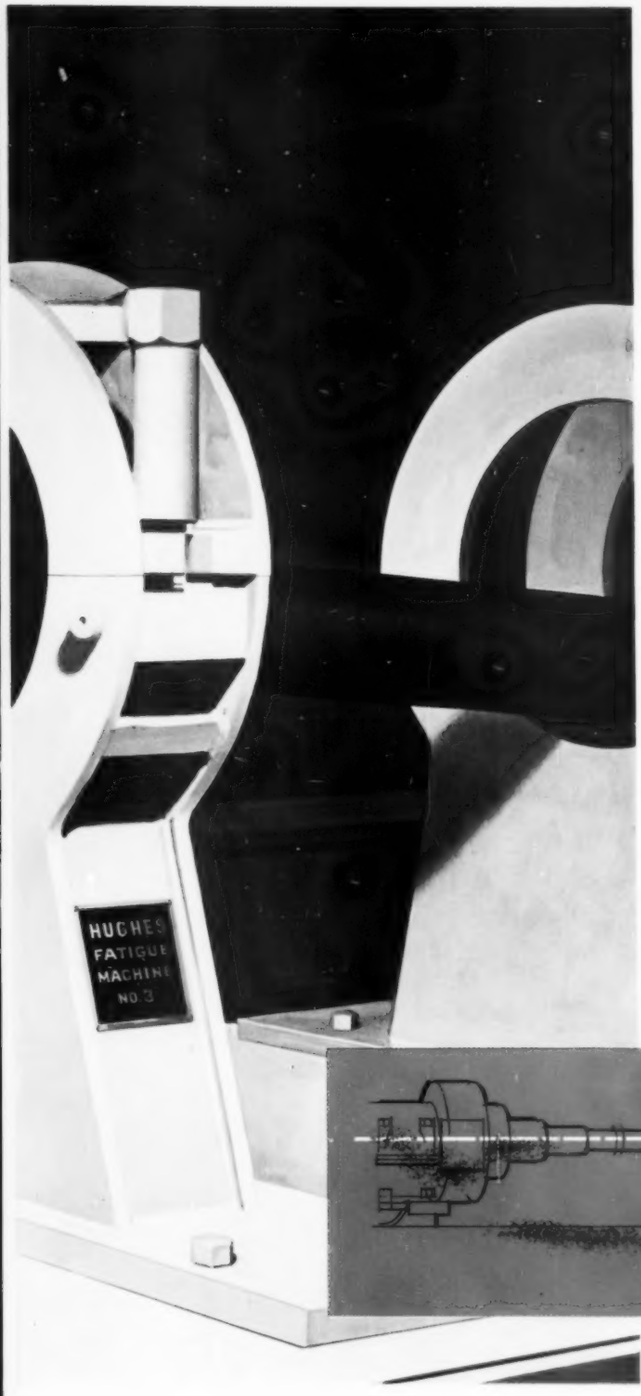
1937 First bucked-on and counterbore welded tool joint — to reduce welding cost for the operator.

1938 Introduction of *first unitized drill stem* — after three years of full-scale research into flash-welding process.

1942 Introduction of hardfacing in depth on "Flash-Weld" tool joints — to lengthen the life of joints.

1942 Refinement of flash-welding techniques — to permit use of smaller pipe upsets.

1945 Introduction of copperplat-



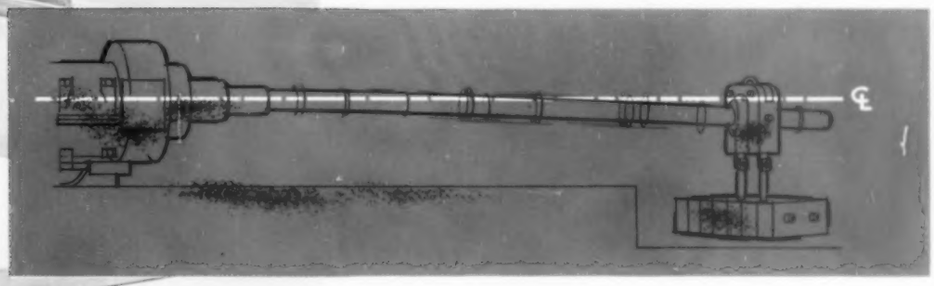
out of CONTROLLED DESTRUCTION comes progress

Three specially designed rotating fatigue machines are kept in operation 'round the year testing drill stem to destruction.

Pioneered by Hughes as early as 1931, the use of fatigue machines has contributed importantly to the advancements made to date.

These machines are now being used in one of the most extensive programs yet undertaken. The purpose: to provide improved tool joint-to-pipe connections to meet the higher stresses of deeper drilling anticipated in the years ahead.

Always out in front, HUGHES' continuing research assures the operator that his drill string — for the *present* and the *future* — will have the most dependable tool joint-to-pipe connections that he can run in the hole.



ing of box and pins — to minimize galling.

1947 Stress-relieving of weld zones in high alloy and all other grades of pipe.

1956 Development of techniques and equipment for cold-rolling large land area of pipe — to strengthen pipe and "Seal-Grip" tool joint assembly.

1957-'67-'77. . . Continuation of the search for the new and better tools for tomorrow's needs.

Developers of Flash-Weld, Seal-Grip and Counterbore Weld Tool Joints

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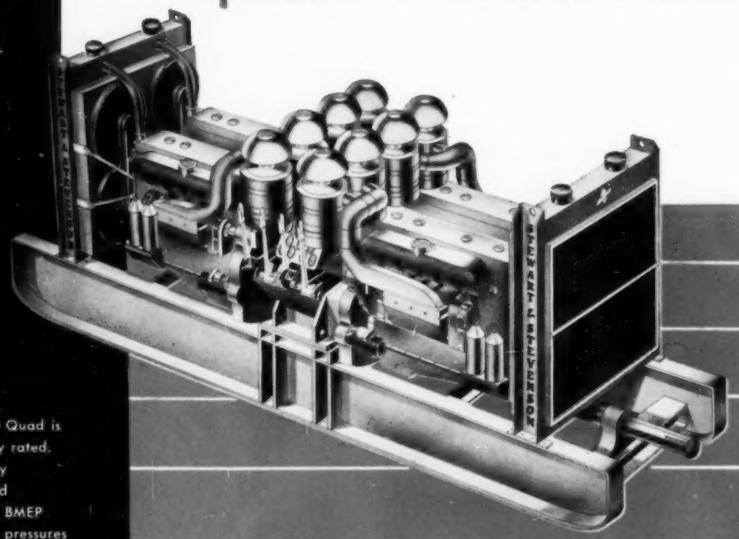
STEWART & STEVENSON...FIRST TO PRESENT A NEW MODEL 6-110 GENERAL MOTORS QUAD APPLICATION

It packs a 1000 H.P. WALLOP! 6-110 QUAD



55% MORE POWER

- Hydraulic actuated disconnect clutches. Power may be taken off either end of the 6-110 Quad. A dual power takeoff arrangement is also available.
- Reduced fuel consumption. The New 6-110 Quad delivers more horsepower per fuel dollar than previous units.
- The 6-110 Quad is conservatively rated. It is naturally aspirated and consequently BMEP and cylinder pressures are low.
- Standard General Motors Diesel Parts in both the gear and engine applications.
- Adapted, developed and guaranteed by Stewart & Stevenson, The Nation's Largest Distributor of Diesel Engines.

This new GM 6-110 Quad, adapted and developed by Stewart & Stevenson, brings to the oil industry a new concept of a compact, high horsepower package at reasonable cost. The new 6-110 Quad develops 880 to 1000 continuous horsepower, or up to 1200 intermittent H.P. It is the largest horsepower engine in its class. It develops more usable horsepower at speeds that are acceptable in more oil field applications than any other engine.

Several years ago, Stewart & Stevenson introduced the Series 6-71 Quad to the oil industry. No other engine unit has ever matched it for service. Now, here is a new, higher horsepower 6-110 Quad with the same characteristics for dependability and performance of the earlier model, *yet with 55% more horsepower.*

The new GM 6-110 Quad by Stewart & Stevenson utilizes approximately 98% standard GM Diesel Engine parts in both the gear and engine applications. It uses tandem twin gear parts in a newly designed and ruggedly built case of welded steel construction, designed especially for the 6-110 Quad application.

The New 6-110 Quad is very compact, and, in most instances, will fit into the same space as the earlier Quad 6-71. This new 6-110 Quad has the lowest unit cost of any diesel engine power arrangement with comparable horsepower.

Please write, phone or call your nearest Stewart & Stevenson Representative or Branch for complete details.

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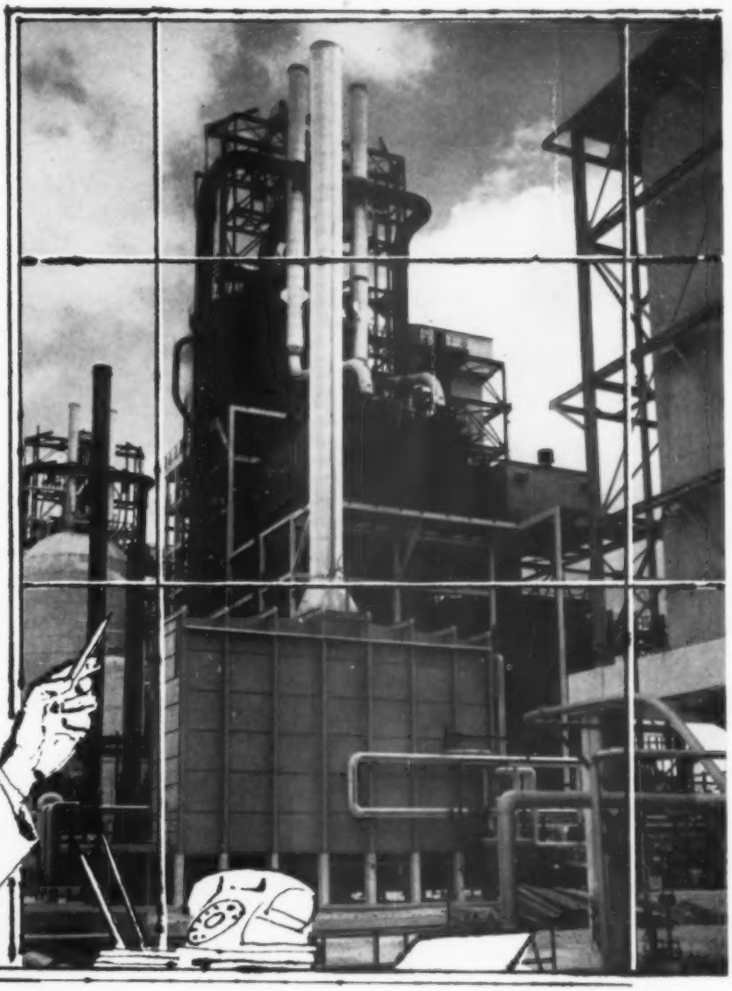
BORN BUILDS BETTER HEATERS



For one thing BORN builds nothing but heaters . . . heaters for every process heating requirement. For over forty-two years BORN has specialized in this field and as a result BORN HEATERS are known for their close control, economical, trouble-free operation plus exclusive safety features not found on any other heaters. During this time BORN HEATERS have built a reputation for producing day after day with no expensive "down-time" for frequent servicing and repairs.

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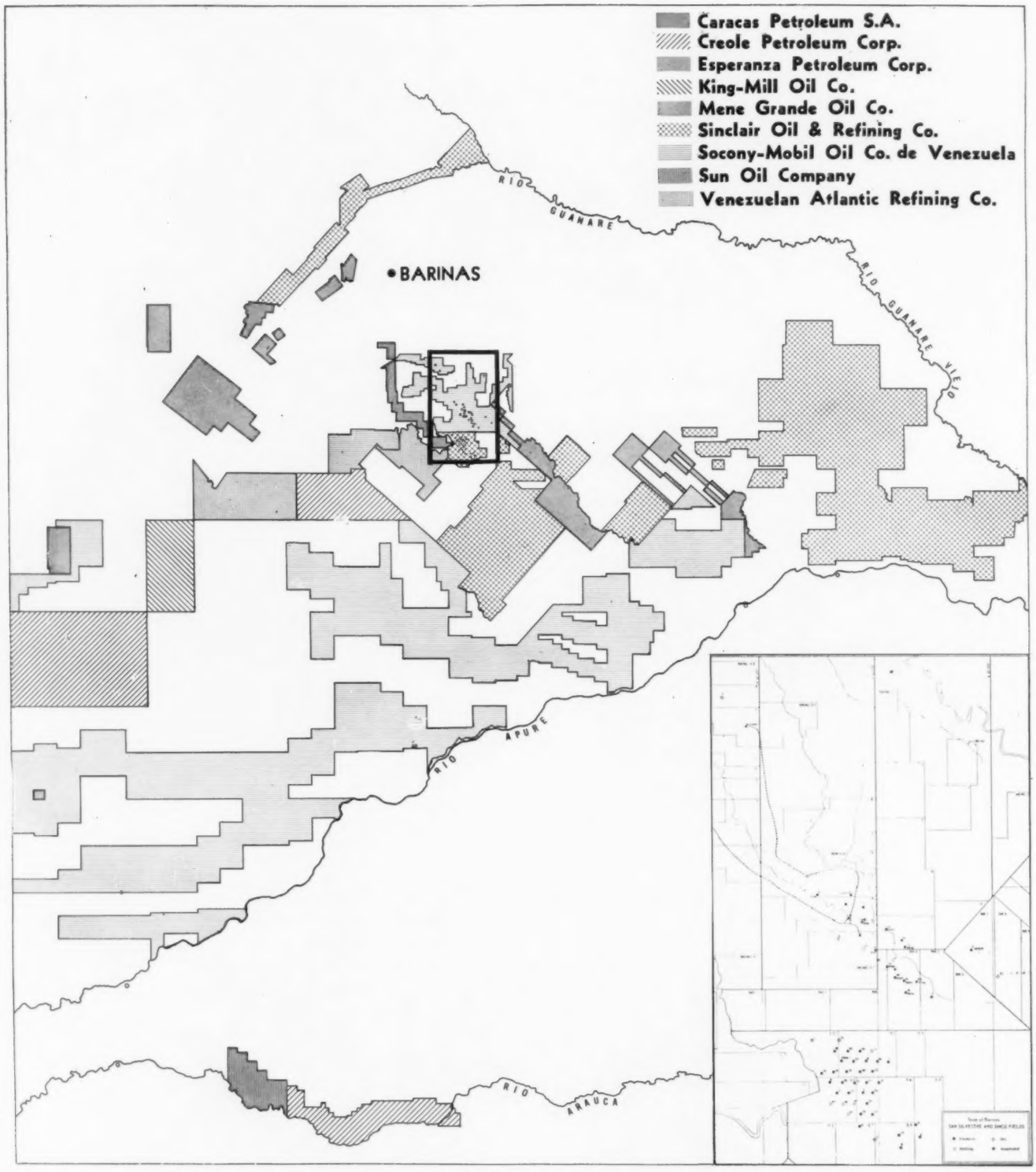
Barinas Oil Search

(*Continued from page 104*)



tion rates lies in the fact that the fields have certain unusual reservoir characteristics and no production history.

Presumably, a payout from present fields is in the cards, even if over a long period of time; but the profitability of the companies' venture—and, in fact, the real future of the oil business in the region depends very greatly on the finding of new oil fields and much larger reserves. It would appear safe to predict that more oil will be found, but there are difficulties in finding it. The finding process is likely to be mainly a wildcat proposition, and future successes will almost certainly be tempered with many disappointments. The early discovery of new fields would, however, do much to establish the oil industry in the region and add impetus to the presently growing development of that part of the country. END

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BASRAH PETROLEUM COMPANY LIMITED:
Fuel storage tanks at Zubair Power House.

When you specify the paint for an oil installation, the stakes are high. On the one side, plant and equipment of enormous capital value; on the other—corrosion, and the terrible losses it can cause. And the dice are loaded the wrong way: sun, sand, salt air and polluted atmospheres will probably be helping corrosion.

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A WORLD-WIDE PAINT ORGANISATION

NT3922a

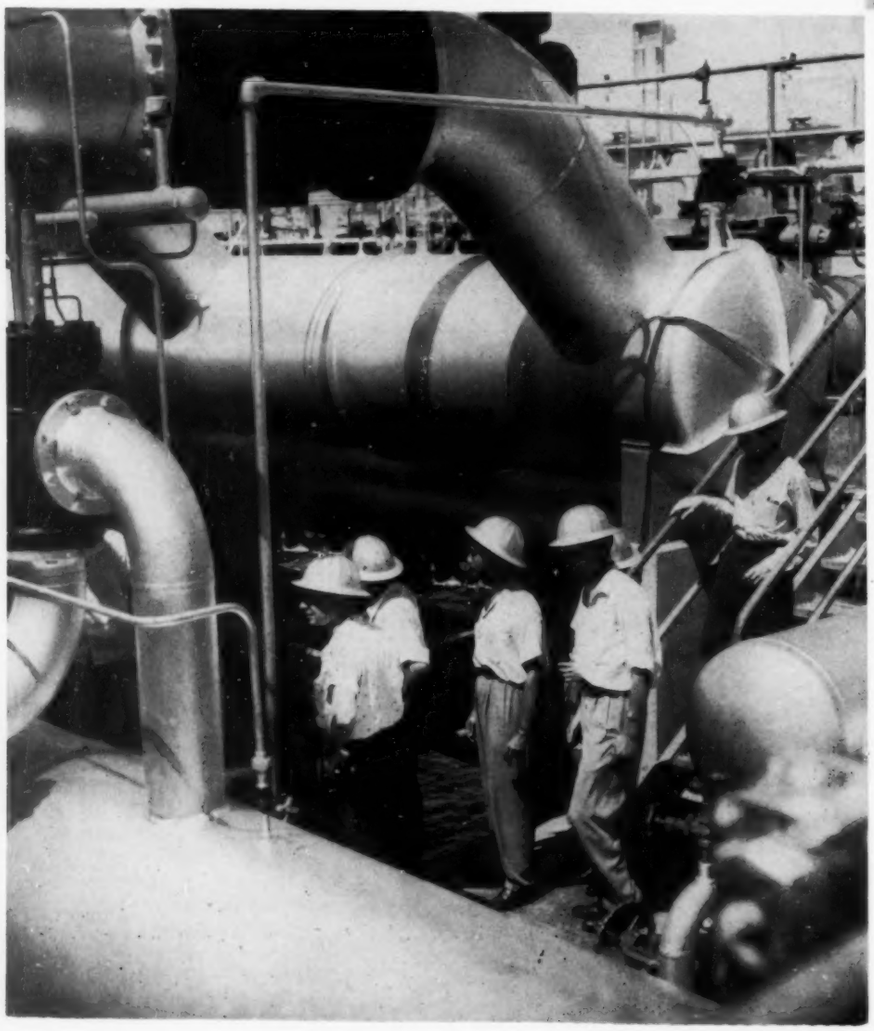
University of Zulia

by E. E. Barberii*

The problem of labor shortage is being solved in Venezuela by a joint government-industry effort, providing a school and facilities for training Venezuelans in operation of their oil industry.

Petroleum Engineering School upper classmen and their professors accompany Richmond Exploration field personnel on a visit to company's Bajo Grande refinery, one-half hour from Maracaibo.

Members of 1957 graduating class visit Shell de Venezuela installations at Cardón.



THE advance of science and technology in the middle of the 20th century has brought into sharp focus the fact that industrial progress demands a vast reservoir of adequately trained and experienced personnel.

The flow of scientific and technical manpower from the more advanced countries to the less industrially developed areas is not so great as people might think. The fact is that the world at large is experiencing a shortage of technically trained people. The more advances made in science and technology, the higher the demand for qualified personnel.

Nations which in the past have contributed with their technical manpower to the demands of the world today find their own needs require all able hands. This is very much the case in the basic sciences—mathematics, physics, and chemistry—and engineering. Therefore, governments, universities, technical societies, and private industries have joined hands in long-range programs to attract the attention of qualified students toward science and engineering.

The shortage of technical manpower in the United States, Russia, Germany, England, and other countries is well-known, and in some instances it is viewed with alarm. This means also that areas which in the past depended on imported engineers and technicians must rely now on their own

*Director, Petroleum Engineering School, Universidad del Zulia, Maracaibo, Venezuela.

Petroleum Engineering School

human resources to fill the gaps.

In Venezuela, the satisfactory solution of the problem presents many challenges because industrial development is running far ahead of the supply of technically trained personnel.

According to the National College of Engineers, the number of registered engineers, as of October 1956, was as follows:

	Number	*%*
Civil engineers	1,407	66.70
Agricultural engineers	174	8.25
Surveyors	100	4.75
Geologists	90	4.27
Architects	85	4.15
Petroleum engineers	56	2.64
Electrical engineers	43	2.04
Mechanical engineers	28	1.32
Chemical engineers	14	0.66
Mining engineers	13	0.53
Others	90	4.60
Total . . .	2,107	100.00

The number of engineers in all divisions, when the industrial expansion experienced by the country during the past 15 years is considered, indeed is not enough. However, the government and private industry have taken notice, and efforts are being made to establish the required educational institutions and to offer courses at the intermediate and university levels.

The Oil Industry: Foremost in the industrial and economic development of the country is the oil industry. In 1956 the country produced 2,456,000 b/d and refined 600,000 b/d.

Venezuela is the world's second oil producer and the first exporter of petroleum. The oil industry operates in Venezuela mostly on an integrated basis; therefore, the need for an organizational structure capable of satisfying from within all the needs to keep it abreast of economic competition is evident. Here, then, an adequate supply of capable men is the key to success.

The oil industry requires a large number of people. Foremost among these are well-trained college graduates in practically all fields of engineering, but more so in petroleum, geological, mechanical, electrical, chemical, and civil branches.

To satisfy their own needs, the companies offer scholarships in engineering and other fields of knowledge. The recipients do their work in Venezuela if the course chosen is available at one of our universities; if not, they are usually sent abroad. Also, after successful completion of studies here, many are sent abroad for postgraduate work or special studies.

Next to their industrial installations, some companies have established apprenticeship schools and refresher courses for skilled labor. The results so far have been very encouraging, and the idea is gaining approval throughout the industry.

These programs show that the industry is taking seriously the idea that, to overcome the skilled labor shortage, training has to be done at home, and part of it within the industry, because future demands are going to be higher for technical personnel and skilled labor.

At the beginning of the year the Venezuelan government granted new concessions totaling some 815,000 acres. This new upsurge of oil activity will increase the demand for technically trained people and skilled labor.

Aside from the oil industry, which employs some 50,000 people—representing less than 1% of the total population and some 3% the nation's total work force—other industries and projects now in the stage of initiation and development will come in shortly for their share of technically trained personnel. These include the cement industry, the petrochemical industry, the electrification project of the Caroní River, the iron mines and steel mills of Guayana, the irrigation projects of the Guárico River and the Boconó-Masparro area, and the many industrial plants now under construction all over the nation.

To fill these needs, the government and private industry have started a broad program which is expected to accelerate the training of personnel and increase the number of technicians needed. Scholarships have been awarded to hundreds of students to continue studies in certain specialized fields in the United States, England, Germany, and other countries.

Universidad del Zulia: A major effort has gone into the university, located at Maracaibo—in one of the most prolific oil regions of the world—which will contribute greatly in the training of personnel. At present it offers courses in law, medicine, dentistry, civil and petroleum engineering, but in the very near future its facilities should be expanded to accommodate students in other branches of knowledge, especially engineering.

Zulia is the second most populated state in the nation. It accounts for 70% of the oil produced, supports a flourishing agricultural program, and a growing cattle industry. Maracaibo, the nation's second largest city and port, serves as the logical gateway to the outside world for the Andean states of Trujillo, Mérida, and Táchira.

Taking a good look at the shortage of native petroleum engineers, the university authorities—fully supported by the government—resolved on September 4, 1952 to establish a petroleum engineering school, at Maracaibo. This resolution was based naturally on the importance of the Maracaibo basin as the No. 1 oil-producing area of the country, and on the magnitude of the Venezuelan petroleum industry on an international scale.

The area offers the students a diversity of problems in exploration drilling, produc-

Vacation studies: Field trips afford students opportunity to become acquainted with equipment.

tion, refining, transportation, and sales. Therefore, great opportunities exist to gain first-hand knowledge by studying the industry close by and by working in it during vacations.

The national government has given the university ample support and ample funds to carry out the program of creating the school. The oil companies have also cooperated fully by offering scholarships to deserving students and by donating equipment for the laboratories.

Oil-equipment manufacturing firms also have contributed donations. The counseling of the engineering staff of the Universities of Oklahoma, Tulsa, Houston, and other institutions and professional societies has been very valuable in organizing the school, which should meet the demands and requirements of the Venezuelan oil industry.

Curriculum: In quality and quantity, the curriculum compares favorable with that now in force in similar schools in the United States and other countries. However, it has been adjusted principally to satisfy the needs of the home industry.

In the first two years, the students take basic subjects—mathematics, chemistry, physics, and auxiliary courses—required by most engineering curricula. In the third, fourth, and fifth year, subjects pertaining to the student's major are gradually included and increased in number, together with other engineering subjects designed to give the student a broad and solid background.

Theory and practice go hand in hand. The students have opportunities to do a considerable amount of laboratory work, and also to do field work during vacation. The course is covered in five years, equivalent to ten semesters of study by American standards.

By subjects and units, the curriculum is divided as follows:

Mathematics	20
Chemistry	9
Physics	9
Geology	12
Mechanics	10
Language and humanities	14
Mechanical engineering	11
Civil engineering	12
Electrical engineering	6
Chemical engineering	10
Administration	5
Petroleum engineering	34
Total	152

Teaching Staff: The teaching staff of the engineering faculty is made up of graduates from Venezuelan, American, and European universities. Those in charge of petroleum-engineering courses have had long experience in the Venezuelan petroleum industry and other oil-producing countries of the world, and also years of teaching experience. Aside from the regular teaching staff, special lecturers from industry contribute their experience and first-hand information in different branches of engineering and related subjects—such as law, economics, accounting, finance, and others.

E. E. BARBERII was born in Tucupita, Delta Amacuro, Venezuela. He completed his petroleum-engineering studies at the University of Oklahoma in 1944, and later joined the petroleum-engineering staff of Creole Petroleum Corp. He was a member of the faculty of petroleum engineering at Tulsa University during 1948-52; in 1952 he became chief petroleum engineer of Mexican American Independent Co., in Mexico. He resigned in 1954 to accept his present position as director of the Petroleum Engineering School at Zulia University.

Professor Alberto Vivas (man with tie) with students on a field trip.

Creole Petroleum Corp. has established the "Creole chair," to be occupied by one of the company's engineers on a yearly basis. This gesture is paramount in the history of education in Venezuela, granted for the first time to any school.

The staff, besides its normal load of teaching and advising of students, participates in extra-curricular activities, and devotes part of its time to public lectures on the oil industry, writing of technical articles, compilation of nomenclature and specifications of oil-field terminology in our own language.

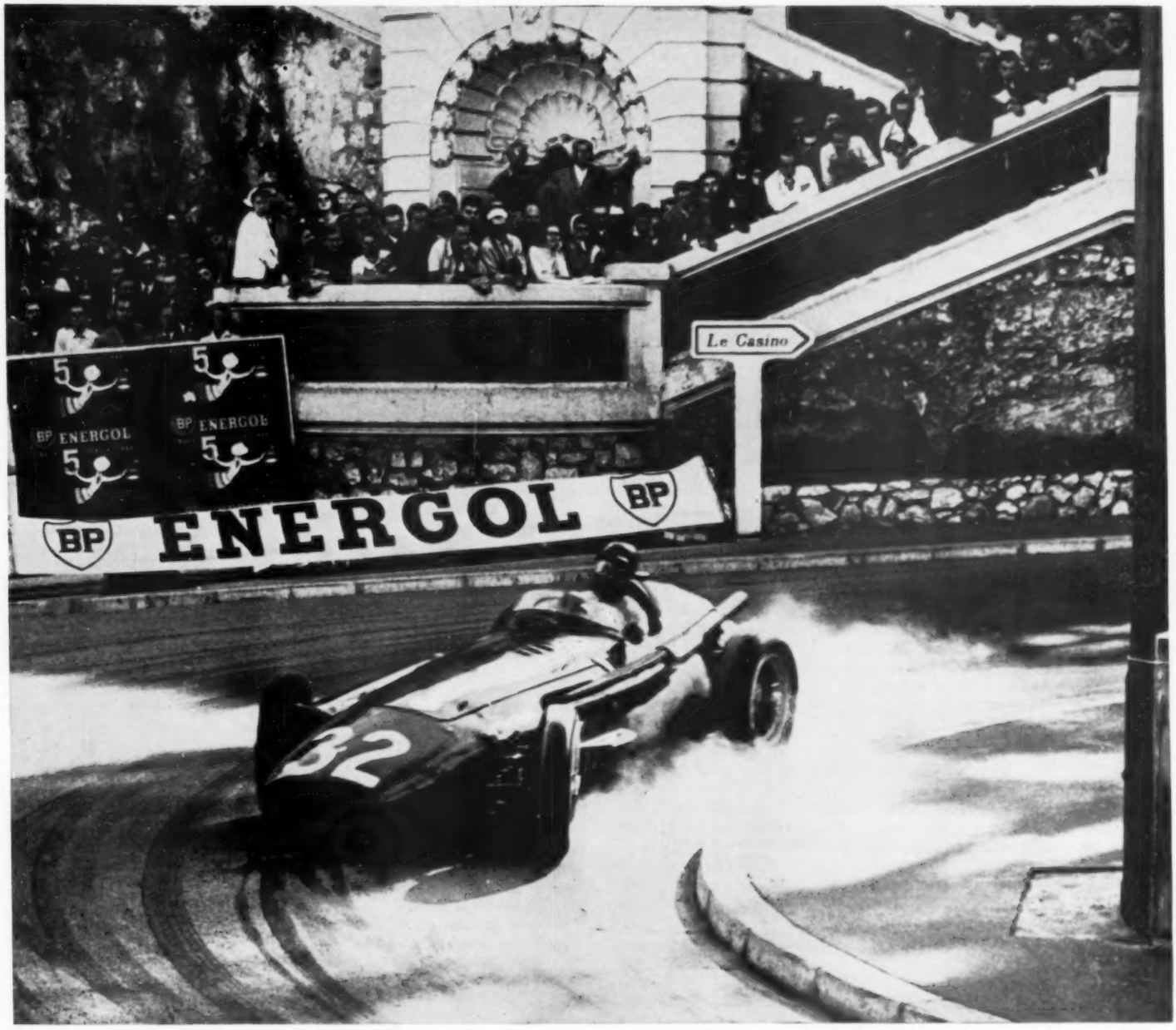
Enrollment: From its very beginning, the School of Petroleum Engineering at the University of Zulia has attracted the attention of high-school graduates. During the year 1954-55, 29 students enrolled; the following year 46 were in attendance; and at present 74 are registered.

Geographically speaking, actual enrollment represents 17 of the 23 Venezuelan states and two foreign countries—United States and Spain. Two girls are currently enrolled; one of these is a candidate for a degree this coming July.

Interest in the school has been shown by students from other countries, and inquiries for admission have been received from Argentine, Brazil, Curacao, Egypt, Formosa, Levanon, and the Philippines.

The location, environment, and general aspects of the Venezuelan oil industry—especially the Maracaibo basin—offer, principally to the Latin American students,

Students acquire first-hand information on a visit to one of Creole's offshore drilling rigs at Lake Maracaibo.



Juan Fangio, driving a Maserati, rounding Tobacco Corner at speed during the Monaco Grand Prix, which he won using BP Fuels and BP Energol Motor Oil

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opportunities which can hardly be duplicated elsewhere. Therefore, it is expected many Latin American students will come to study here in the near future.

Scholarship Program: The University, through the students' welfare organization, offers scholarships and assistance to deserving students. This help consists of board and room, tuition, and textbook and supplies according to the needs of the individual.

Private industry has also established scholarships; at present 33 students of petroleum engineering have been selected for such awards. The sponsors are: Compañía Shell de Venezuela, Creole Petroleum Corp., the Ministry of Mines and Hidrocarbons, Socony Mobil Oil Co. of Venezuela, Mene Grande Oil Co., Richmond Exploration Co., Compañía de Cementación y Fomento Halliburton, Core Laboratories de Venezuela, and Tito Abbo Jr. & Bros.

To attract the attention of qualified high-school graduates, the university and the oil companies have outlined an information program which is now being conducted throughout the country. The central idea behind the program is to give the student an opportunity to hear about the different fields of engineering and help him to think about his aptitudes, high-school accomplishments, and physical and emotional makeup, if he is interested in engineering.

The program also serves to rescue deserving boys from abandoning the idea of going on with their studies for lack of financial means. In fact, the program is so ambitious that it considers the sponsorship of promising students while they are still in high school.

Physical Plant: To accommodate the increase in enrollment expected from the establishment of the Petroleum Engineering School, and to provide facilities required by modern teaching techniques, the Venezuelan government, through the Ministry of Education and the Ministry of Public Works, donated funds to the university for the construction of buildings for the engineering faculty on the new campus. There are three major buildings and annexes under construction, with a total floor area of 150,000 sq ft, at a cost of approximately $1,350,000. These buildings are expected to be in use by September 1957.

Furniture for classrooms and laboratories was purchased from Laboratory Furniture Inc., Mineola, N. Y. The equipment for the laboratories was ordered, and been received, from W. H. Curtin, Houston; Central Scientific Co., Chicago; Arthur H. Thomas & Co., Philadelphia; The Refinery Supply Co., Tulsa; Milton Bradley & Co., Boston; Claridge & Co., Harrison, Ark.; Ward's Natural Science Establishment Inc., New York; American Optical Co., Southbridge, Mass.; American Meter Co., New York; Baroid Sales Division, Houston; and International General Electric, New York.

To the equipment acquired with funds given by the national government, it is gratifying to add the complementary donations, equipment, teaching material, and/or technical assistance received from Creole Petroleum Corp., Compañía Shell de Venezuela, Mene Grande Oil Co., Richmond Exploration Co., Socony Mobil Oil Co. of Venezuela, Phillips Venezuelan Oil Co., Baker Oil Tools, Cameron Iron Works, Reed Roller Bit Co., Oil Center Tool Co., and Mission Manufacturing Corp. Assistance from these firms has been invaluable.

Boys' Dormitory: While the student population was small, the university had no problem providing board and room. In fact, the largest number of students were Maracaibo residents. However, present enrollment is close to 1,200, and this figure is expected to keep on increasing in the near future. Therefore, the university authorities have made provisions to take care of out-of-state students and students from other countries.

No time has been lost in translating these provisions into reality. Using her own funds—and with assistance from the municipality, local business firms, and individuals—the university built in record time a modern dormitory for boys as the first step in a long-range program to offer economical but wholesome board and adequate room to the students.

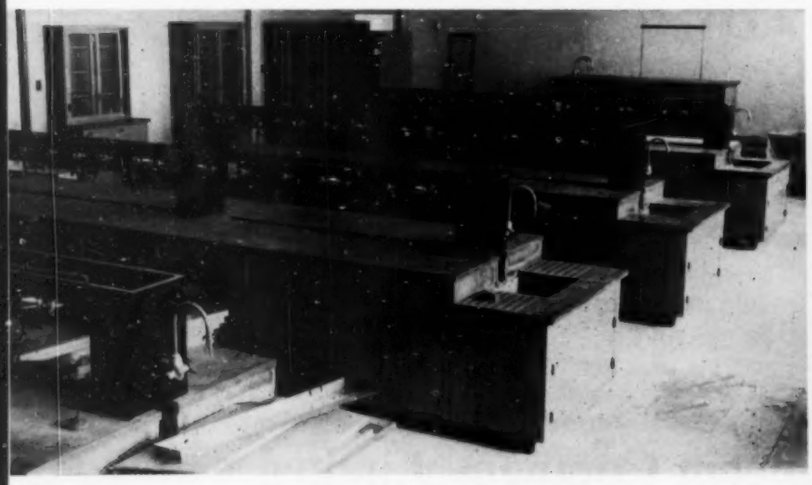
The dormitory, built at a cost of $600,000, with a floor area of 57,912 sq ft, was inaugurated December 15, 1955. At present 150 students live here; but, when a second floor is built in the left wing, capacity will be increased for 200 students. The cafeteria serves 300 students during any meal. Other features of the building are an air-conditioned study hall, private dining room, soda fountain, and ample recreational areas—reading room, spacious corridors, and tennis courts.

Monthly payment for room and board is the same if the resident takes a single, double, or three-bed room. Students with a high scholastic record have first choice to single rooms, if they prefer.

An interesting experiment in dormitory management is the one currently in force by students here. The dormitory is under the complete responsibility of an administrator and three council members—all upper classmen—directly responsible to the administrative council of the university. The students have discharged their duties exceedingly well, and all details pertaining to upkeep, food, study hours, recreation, and discipline have been handled with great regard for duty by overseers and the rest of the student body as well.

END

Modern laboratory at new engineering building.



Aerial view of buildings under construction, for occupancy in October by engineering faculty: Upper left, wing for Petroleum Engineering School; upper right, wing for Civil Engineering School; extreme right, auditorium; center, library; foreground, laboratories.

Where there's natural gas . . . and the demand for independent power supply . . . there's almost certainly the need for Ruston Gas Turbines! These modern prime-movers are essentially *long life, continuous-service units* — their simple construction reducing wear and maintenance to a new low level. Easy to install, space-saving, requiring no water and having 'Ruston Dependability,' they are unequalled for crude oil pumping, compressor drive, electric power generation *plus the supply of process heat or steam where required.*

These Ruston Gas Turbines have been installed to run on natural gas and to supply power for the entire works of C.A. Cemento Carabobo Sucra, Valencia, Venezuela.

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General view of La Salina area.

Opening of Maracaibo to large tankers fits in with the world trend toward larger ships. The oil companies in Venezuela are not far behind, as will be shown when .....

La Salina Platform

EVENTS of the past few months have brought to prominence a trend in the handling of crude oil which has been developing rapidly. Reference is made to the speed with which the Suez Canal was blocked and the resultant necessity for transportation of crude oil by tanker over longer routes. The loss of this facility served to emphasize dramatically the obvious need for larger and faster tankers.

Actually this need has long been recognized, and the construction of tankers has been increasing in size at an amazing rate. A few years ago a 16,000 dwt tanker was considered as large; now there are 15 supertankers of 40,000 dwt capacity and larger in service—with one, the "Universe Leader," going as high as 84,730 dwt. In addition, various firms have on their design boards, or under construction, several tankers exceeding 100,000 dwt.

All this shows that the day of the small tanker, except for specialized services, is drawing to an economic close. We are now entering the era of the supertanker.

This step forward to larger and more economic tankers has naturally brought other factors into the picture. Supertankers require larger and stronger docking facilities, deeper channels and harbors, and loading facilities with larger capacities.

The Creole Petroleum Corp., operating throughout Venezuela, has concentrated a majority of its producing operations on the east coast of Lake Maracaibo, where it has been operating since the early 1920's. All the crude oil produced in this area must be transported to the refinery in Aruba, to Creole's large refinery at Amuay which is located on the north coast of the Paraguaná peninsula, or to other outside customers.

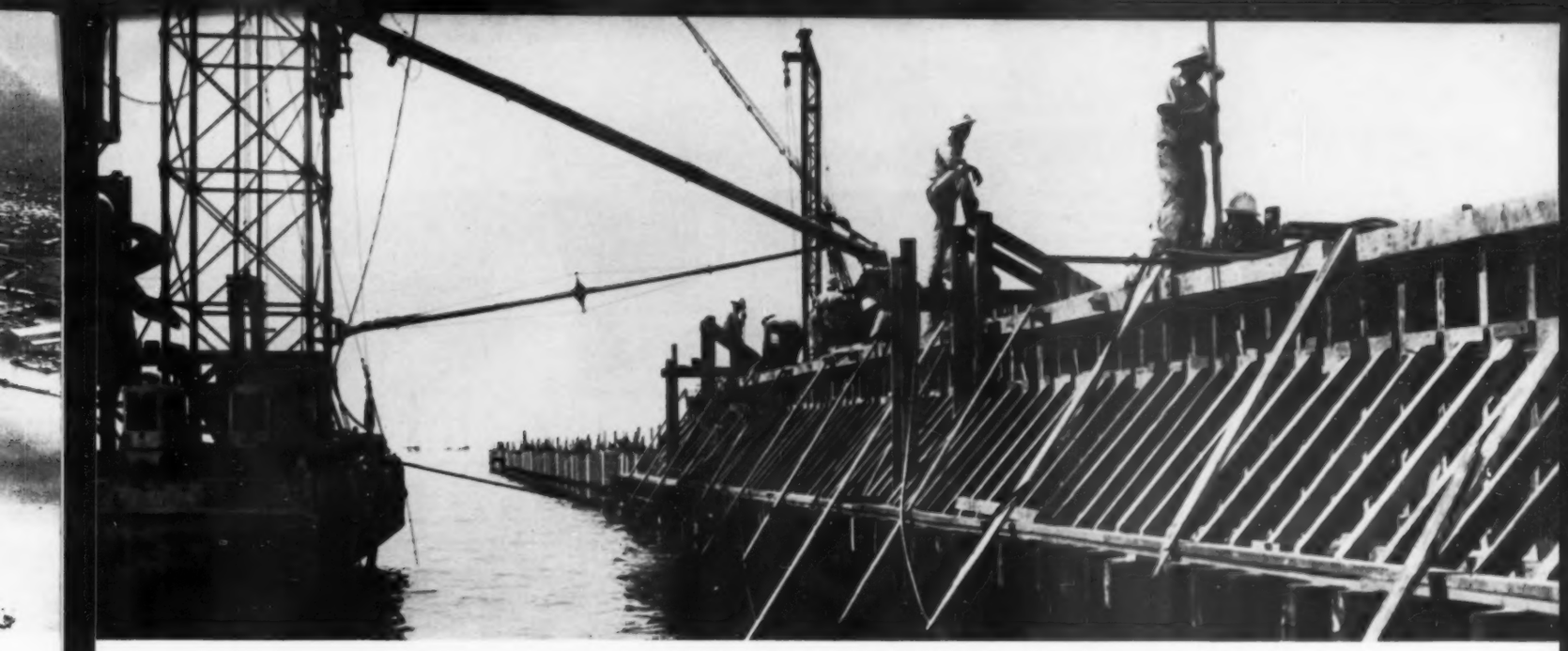
Part of this production is handled by twin pipelines running overland to the Amuay refinery. The present capacity of these lines is 500,000 b/d. The balance must be carried by tankers from Lake Maracaibo to the Caribbean Sea.

Lake Maracaibo is a fresh-water lake of approximately 5,000 square miles in area, approximately 100 ft deep. The coastal oil fields extend well out into the eastern side of the lake below Punta Icotea. The entrance to the lake is through Tablazo Bay and the Strait of Maracaibo, where a navigation channel has been maintained by continuous dredging to a depth of 21 ft. Alignment of this channel has been unstable, with continued shifting east and west. The restrictions imposed by this dredged channel have limited tankers to approximately 90,000 bbl maximum capacity.

Early in 1950 and 1951 the Venezuelan government decided that it would be an important economic asset to Venezuela to open Lake Maracaibo to deep-draft ocean shipping. This project, involving the straightening of the channel and deepening to 35-ft depth, was scheduled for completion in 1955.

It had been apparent to Creole for some time, in consideration of future operations, that an increase in transportation facilities would have to be provided to cope with increasing production. Due to the limitations in tanker size imposed by the bar restrictions, consideration was being given to additional pipelines to the Amuay refinery and to separate pipelines to a new deep water port to be located somewhere on the north coast of Venezuela where ocean-going tankers would have ready access. The government's decision to dredge the bar and open the lake to deep-draft vessels provided an alternative solution to these previous proposals. It would now be possible to construct a deep-water terminal in Lake Maracaibo with the location dictated by economic and physical factors.

Creole decided to initiate an immediate study of sites, types, and capacities of terminal required. To assist in this work, a consulting agreement was negotiated with Frederic R. Harris-Oficina Técnica Bernádo Nouel. This firm, whose experience in port and harbor development was extensive, began site investigations, layouts and



Floating concrete plant: Pouring is done directly into the forms.

Admits Big Tankers

cost estimates of construction at each site, and studies of each layout from the standpoint of operations, economics, and feasibility with regard to future development and progress.

Certain fundamental assumptions were made and used as a general guide. A primary assumption was that sites south of La Salina would not be considered in order to keep ocean tankers from entering the main lake oil fields. On this basis, several sites from La Salina north were selected as being generally acceptable for further detailed study.

The capacity of the terminal was set at 350,000 b/d initial throughput, with a designed capacity of 1,250,000 b/d. Rates were established at 40,000 bbl per hour per tanker, with a maximum terminal rate of 80,000 bbl per hour. Usable depths were to be investigated at 35 ft, 40 ft, 45 ft, and 50 ft. Another factor included in this preliminary analysis was the effect on shipping of the construction of a bridge across Lake Maracaibo.

Four basic schemes were originally considered: (1) finger piers with filled land to be used for a tank farm; (2) finger piers with access trestle pier from shore, and shore tankage; (3) offshore pier with submarine pipelines; (4) marginal wharf along the shore line.

A detailed study was made of the logical locations for this deep-water terminal. This study included soundings to determine water depths and approach-channel distances; soil borings to determine load capacities, distances from existing facilities which were necessary to assist in calculation of labor supply, increased pumping costs, etc.; availability of land for shore-based facilities; interference with lake traffic, drilling operations, or shore-based installations; and many other physical and economic considerations.

La Salina was finally selected as the site of the new terminal, since it would require the minimum initial capital investment, minimum time to put into operation, and the minimum operating cost. The fact that existing facilities could be incorporated in the development of this terminal, and the fact that economic future expansion would be possible, all contributed toward the decision to construct the terminal at La Salina.

Since there were no terminals existing of the capacity and type required, it was necessary to consider many schemes—some of them quite radical in characteristics. Among the many schemes considered, and eventually discarded, were normal concrete piers along the shore with shore tankage, a structural-steel pier floating on pontoons with shore tankage, and even a complete floating concrete terminal with all tankage and berthing facilities as an integral part of the floating structure to be located in deep water and connected by submarine lines. These designs and many others were eliminated for reasons which varied from costs, location difficulties, availability of materials, ease and rapidity of construction, to technical design considerations.

The design finally selected consisted of an artificially constructed area of land located in approximately 20 ft of water, 1½ km west of the present terminal of La Salina in Lake Maracaibo. Finger piers were to be constructed from this filled area to provide the necessary berths. The terminal would be connected to shore by a trestle which would carry the loading and utility lines, as well as provide a vehicular and pedestrian roadway.

The terminal proper is built of a reinforced-concrete sheet-pile bulkhead 600 meters by 850 meters filled with dredged material taken from the access channel and turning basin. This bulkhead required approximately 3,000 sheet piles 12 in. x 36 in. x 35 ft and a reinforced-concrete cap 3 ft x 3 ft 6 in. poured along the complete length of the wall. Batter piles were driven alternatively inside and outside on approximately 6-ft centers and tied into the bulkhead cap. These piles provide the necessary stability for this sheet-pile wall during the placing of the dredge spoil as well

as during the life of the terminal. Approximately 1,500 reinforced-concrete batter piles 14 in. x 14 in. x 45 ft were driven at an angle of 30 deg to the vertical to provide this bracing. Joints in the piling were keyed and sealed by grouting.

The material for fill was provided from the dredge spoil. Access to this terminal is via a dredged channel and a turning basin immediately west of the terminal. Dredging of the first phase of this project is being done to a 38-ft depth to agree with the 35-ft channel at the lake entrance. Approximately 4,200,000 cubic meters of fill will be dredged and placed in the island proper. The completed terminal will provide approximately 125 acres of usable land for tankage and associated facilities.

Initially, two piers providing four berths are being constructed. Provision has been made for the construction of two additional piers which will bring the number of berths available to eight. Further expansion beyond this point is also possible.

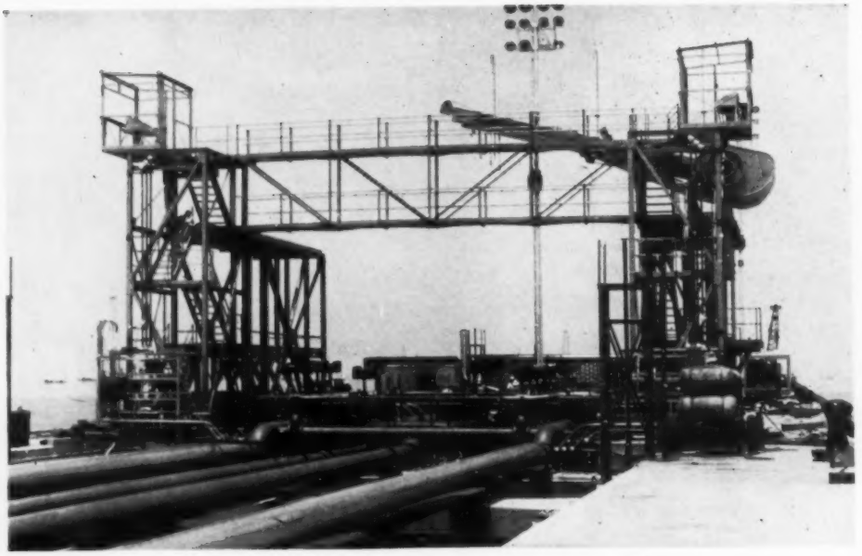
The initial two piers are 1,100 ft by 80 ft, and are built of reinforced-concrete piles with a cast-in-place deck. Although these piers are built to provide berths for 45,000-ton tankers, their design and pile length have been calculated so that only additional dredging to a depth of 45 ft is required to adapt them for 60,000-ton ships.

The government dredging program was announced as a 35-ft channel; but it was realized that it was quite probable that additional dredging would ensue, and that even larger shipping would have access to the lake. Creole, therefore, decided to provide for this possibility; and, based upon the ultimate estimated channel depth and the probable increase in size of tankers over the useful life span of the terminal, settled on a 50-ft ultimate depth.

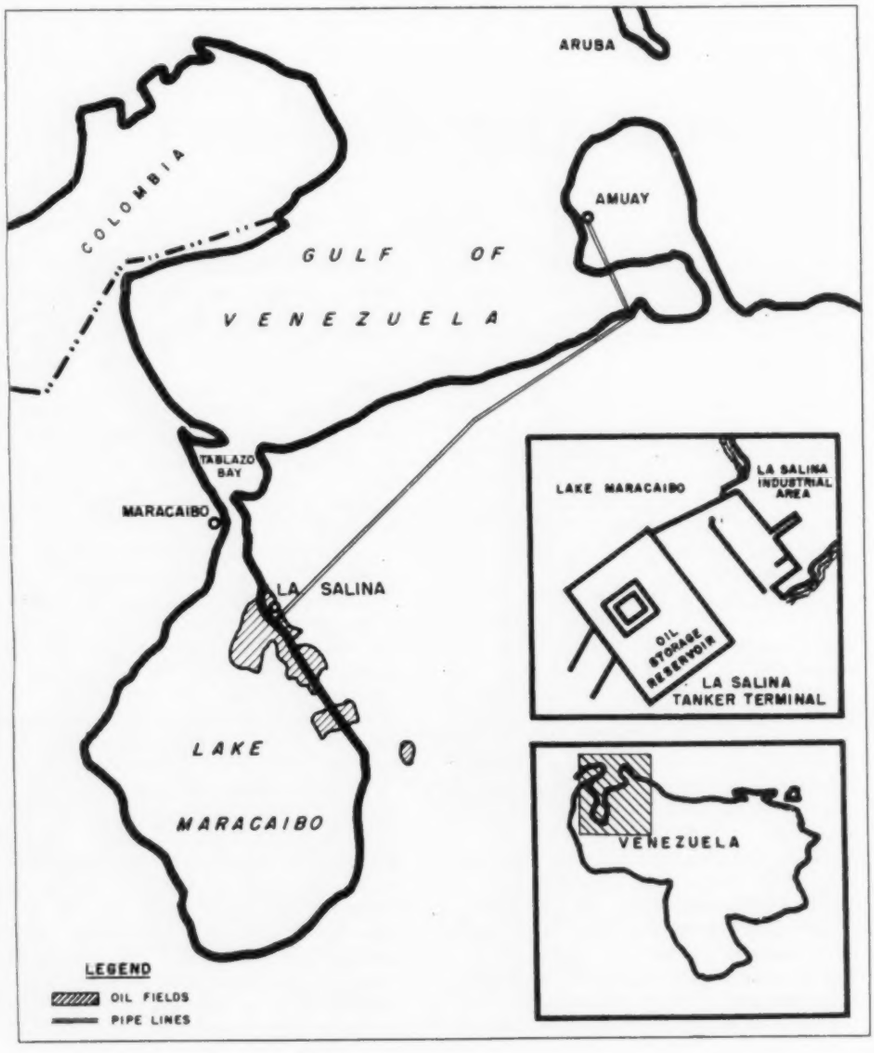
Approximately 369 piles 20 in. x 20 in. x 70 ft were driven for each pier. Driving conditions on the whole were difficult, but the driving proceeded in spite of the difficulties. Initially, before driving had begun, the areas in which the pier piles were to be driven were dredged to a depth of 45 ft. This was done so that if and when the ultimate depth of 50 ft was required, it would not be necessary to attempt to excavate around the piles. All driving was done by steam-powered barge-mounted pile drivers.

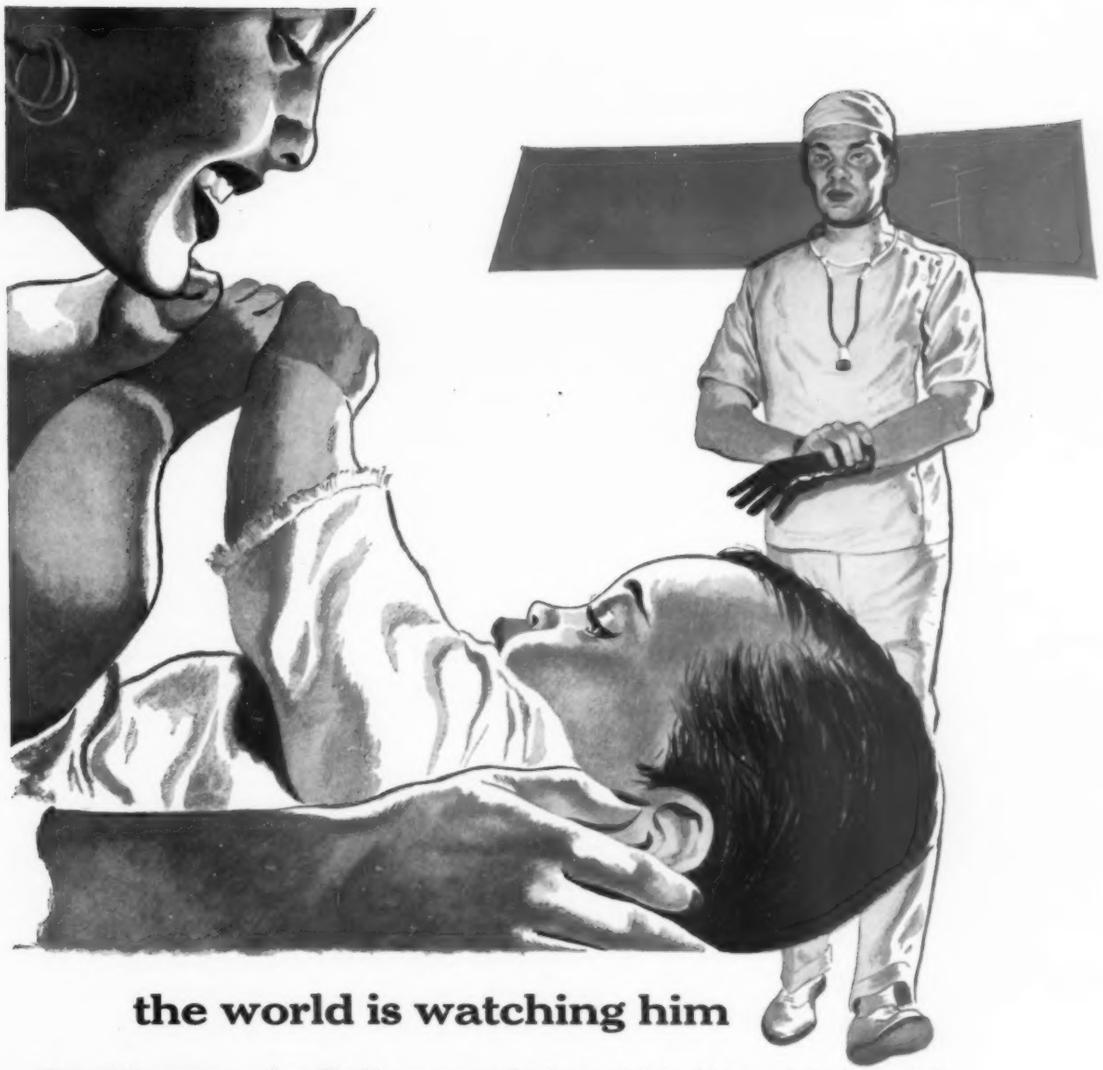
The deck and the structural ties for the pier are all of reinforced concrete, poured in place. Pouring for this part of the job was handled on a rapid and efficient basis from a barge-mounted mixing plant which moved along the pier and poured directly into the waiting forms. Curing took place under dampened burlap.

A relatively new type fender system is being used on these piers. This fender system incorporates a new type buffer called the "Raykin fender buffer," which involves the rather unique principle of rubber and steel sandwiches in place of the more common springs. The use of this type buffer results in a lesser reaction force on the pier than that developed by a spring buffer of



Chicksan loading device showing elevated control point and panel on each side, as well as partly installed loading arms: Pipe alley and manifold are in foreground.





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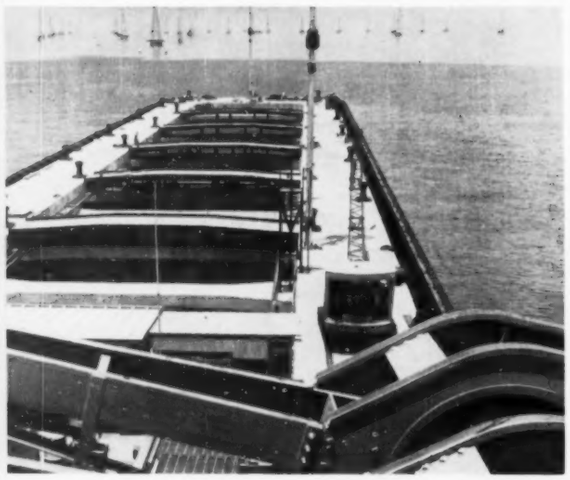
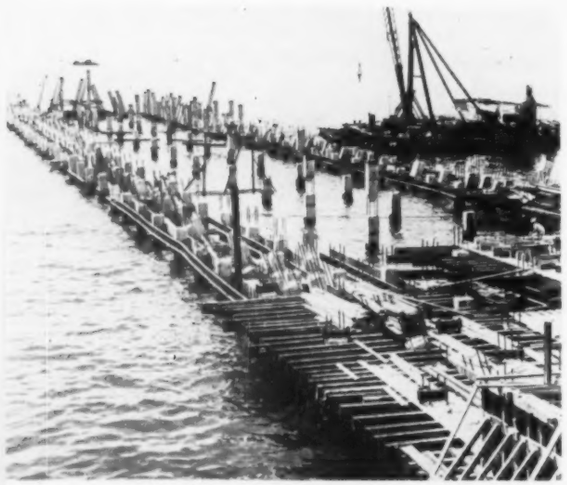


View of lakeward end of pier No. 7 from top of Chicksan loaders, with part of loading arms and counterweights in foreground: Access ramps from one side of pier to the other are shown over ties.

Terminal Lamstre, La Salina.



Pier No. 7 construction, showing form assembly.

equal capacity, deflection, and energy absorption. This rubber buffer will also withstand the longitudinal loads exerted by a tanker—thus making unnecessary the elaborate guides required by spring buffers.

Another relatively new device incorporated into this pier is the Chicksan loading device. These have been installed on one or two terminals in the United States, and provide an extremely flexible and rapid loading line connection between ship and pier. Basically, they consist of a tower with a series of articulated levers and arms supporting and directing a loading line made up from aluminum pipe sections connected by Chicksan flexible joints. One man from the control panel in the tower or by a remote control can operate the unit through its hydraulic mechanism. With this unit, one operator can do everything necessary to hook the loading lines to the tanker with the exception of the actual bolting up of the flanged connection. The usual crew and hoist system, normally employed to manhandle the extremely stiff heavy-rubber loading hoses, are not needed, and connections are made and broken in a fraction of the usual time.

The loader has enough inherent flexibility through its design to accommodate varying sizes of tankers and heights of piers. Once connected to a tanker, a free-wheeling arrangement goes into effect, so that through the articulated joints automatic compensation is made for tidal changes and varying drafts.

As an integral part of this terminal development, the question of storage facilities had been considered. The quantities of crude oil to be handled indicated a need for approximately 12 000,000 bbl of storage which must be subdivided into various tankages to enable several segregations to be handled at once.

In a location such as that of La Salina, which is a tightly packed industrial area, the space required to install such a large amount of tankage would be extremely difficult, if not impossible, to find; in addition to which the use of such expensive land for this purpose, even if available, would add greatly to the cost of this new terminal installation. This situation was, as can be seen, another of the deciding factors in the decision to make new land available for this use.

At the same time, several ideas concerning cheaper types of storage were being investigated. It became obvious at once that large sizes of tankage were a much cheaper installation than numerous smaller tanks. Naturally, it would not be possible to go to the extreme and construct one 12,-000,000-bbl tank, since segregation, safety factors, operational procedures and fiscalization, all had to be considered. However, it would be possible to use a combination of large and small tanks to achieve the economy and flexibility of operation desired.

By investigating large tanks, it was found that the largest steel tanks available commercially were about 268,000-bbl capacity. Since Creole's ideas on economical tankage ran to sizes much larger, it was necessary to design and build something new.

One of the original solutions proposed was concrete tankage. Both ordinary reinforced concrete and prestressed designs were looked at in approximately 1,000,000-bbl capacities. Eventually designs were worked out for both of these.

Another idea for "reservoirs," as Creole had begun to call these large storage facilities, was to use earthen storage pits, somewhat similar to the earthen storage pits presently in use at Creole's Amuay refinery. The main difference would be in size and in the fact that, for the Amuay storage, advantage was taken of a natural depression which was dammed across the open end, while the terminal storage would be completely enclosed by an earthen dike. The design, as worked out for this pit-type storage, was for an 1,800,000-bbl-capacity reservoir. At the present time, the decision is still pending as to which of these two types of reservoirs will be constructed. Designs for both have been worked out; either will provide a very economical and practical solution to Creole's storage problem.

The initial tankage to be installed on the island terminal has been set at two 268,-000-bbl steel tanks and one reservoir. Additional tankage and reservoirs will be added as time permits and the throughput increases.

The problems relating to the installation of the steel tanks are quite normal—requiring very little more than a routine analysis of the dredge fill, together with a few additional steps in foundation preparation which are necessary because the normal settling period for a new fill will not be allowed. The tanks are to be erected as soon as possible in order to avoid any delay in the use of the new terminal.

The reservoirs were not so simple as they appeared on first consideration. An extensive study of the factors involved was made in conjunction with Creole's concrete and soil consultants. Since the soil conditions under the lake bottom were quite unique, and since this filled area was to be recently deposited and unconsolidated dredge spoil, the questions of load-bearing capacity, uplift in the tank area due to surrounding pressures with an empty tank, permeability of the earthen walls, workability of the soil, and such factors had to be given quite careful consideration. However, all these detailed design problems were solved to everyone's satisfaction after a complete series of soil samples had been taken, and water level, permeability, and drawdown tests had been made.

Consultants for this phase of the work were Dr. N. M. Newmark, Dr. R. B. Peck, and Dr. T. W. Lambe

As the designs for Creole's large-capacity reservoirs were developed, the question of suitable roofs for the various types arose. Both fixed and floating roofs were investigated, and consideration was even given to

(Continued on Page 152)

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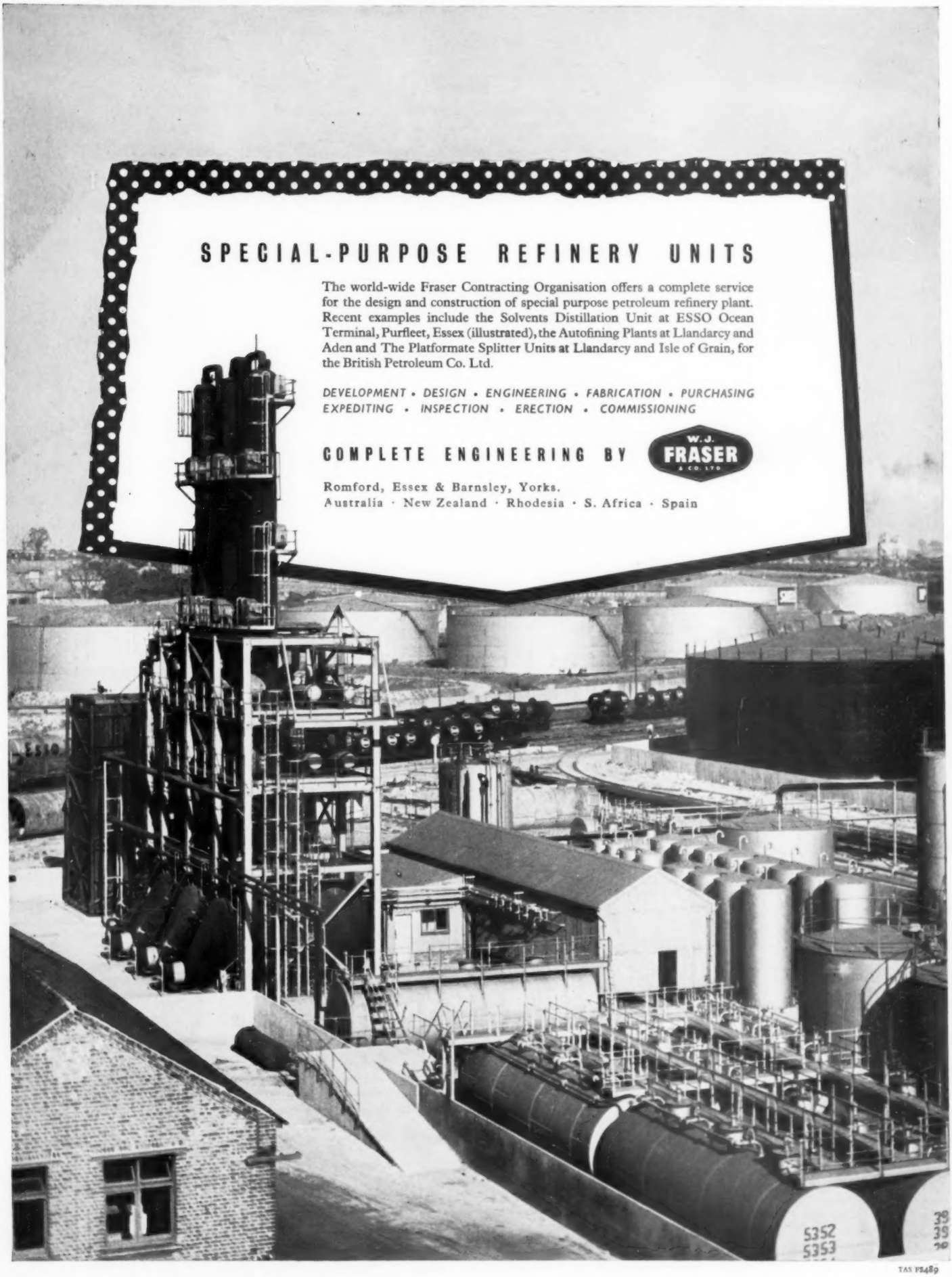

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PIPELINES IN VENEZUELA

THE pipeline system of Venezuela is growing with the country's increasing importance in the international oil scene. The total of principal crude lines reached 2,116 miles at the end of 1955, and there are presently 2,116 constructing additional lines which will raise the total to nearly 3,000 miles by the end of this year.

Five companies have the principal lines. They include Cia. Shell de Venezuela, Mene Grande Oil Co., Creole Petroleum Corp., Socony Mobil Oil Co. de Venezuela, and Sinclair Oil and Refining Co. (the last through its 25% participation in the Barinas-Pto. La Cruz line described elsewhere in this issue).

Creole's pipelines are shown in the accompanying maps. In addition to the pipelines shown, Creole is about to construct a 26-in. 9-mile crude-oil pipeline from Ulé to La Salina which will have an initial capacity of approximately 450,000 b/d. Completion of this line is scheduled for 1st quarter 1958.

It is estimated that Creole has approximately 900 miles of 4-in. and 6-in. pipe on the bottom of Lake Maracaibo conducting crude oil from active wells, of which there are approximately 1,570, to flow stations and an additional 300 miles of 6-in. to 24-in. pipe in crude lines from flow stations to the shore of the lake. Of the total Creole crude production in the Bolívar coastal field, approximately 84% is from natural-flow wells, 3½% from gas-flow wells, and 12½% from pumping wells. The flow stations, of which Creole has 100 in the Bolívar coastal field, in general receive crude oil from about 20 wells, hold the crude in four or six 1,500-bbl tanks for from 4 to 36 hours, and then pump it to shore at rates up to 60,000 b/d. The flow-station reciprocating pumps, which vary in number from two to eight, are driven by electric motors varying in size from 100-hp to 200-hp. All but six of the 100 flow stations are unattended, and Creole is planning further to increase operating efficiency with the installation on the flow station of automatic well-test programming equipment and transmission equipment for sending data to shore.

TABLE I
OPERATING DATA FOR PIPELINE SYSTEM—CREOLE PETROLEUM CORP.

Pump Stations

	I. Crude oil	Prime Mover (Hp.)		Pump
A.	Ulé No. 1	7-940	G.D.	Recip.
B.	Dabajuro	7-940	Di.	Recip.
C.	Ulé No. 2	4-1,650	Gas	Cent.
D.	Lagunillas	5-300	Elec.	Cent.
		1-1,000	Elec.	Cent.
E.	Punta Gorda	1-250	Elec.	Recip.
		1-200	Elec.	Recip.
		4-75	Elec.	Recip.
F.	Mulata	2-250	Elec.	Cent.
G.	Quiriquire	3-300	Elec.	Cent.
H.	Jusepín	4-250	Elec.	Cent.
I.	Temblador	3-75	Elec.	Recip.
	II. Products			
A.	Catia La Mar	3-640	Di.	Cent.

G.D. = Gas Diesel. Di. = Diesel.

Tank-Farm System

	I. Western Venezuela	No. of Tanks	Barrels
A.	Lagunillas	18	80,000
		2	75,000
B.	Ulé	11	150,000
		8	80,000
C.	Punta Gorda	8	80,000
		1	75,000
D.	La Salina Terminal	3	116,000
		5	80,000
		4	75,000
		5	55,000
E.	Dabajuro	3	96,000
F.	Amuay Terminal	25	150,000
G.	Cumarebo Terminal	2	80,000
		1	55,000
	II. Eastern Venezuela		
A.	Mulata	3	55,000
B.	Jusepín	5	55,000
C.	Quiriquire	5	55,000
		1	80,000
D.	Caripito Terminal	3	116,000
		6	80,000
E.	Pedernales Terminal	2	80,000
F.	Temblador	9	5,000
G.	Boca de Uracoa Terminal	2	80,000

Cia. Shell de Venezuela: Shell's system of pipelines in western Venezuela has expanded by about 621 miles in the past six years. Of this, about 453 miles correspond to the main lines described below.

The *"Lightline"* is a 163-mile trunk line for light-crude transport from Palmarejo tank farm to Cardón refinery, with an extension to Meneg's terminal at Las Piedras. The nominal diameter is 30 in., except in the 8-km Lake of Maracaibo crossing where two 20-in. parallel lines are laid on the bottom of the lake (15-meter depth). The land sections (248 km) have a wall thickness of $\frac{7}{16}$-in., grade x-48 and $\frac{5}{16}$-in. grade x-52, without protection except in rivers and road crossings and in the "salinas," where special care was necessary. The two 20-in. lines in the Lake of Maracaibo crossing (8 km) have a wall thickness of ¾-in. grade "B," which assures the negative buoyancy; they are laid 300 meters apart, buried in ditches 2 meters deep, and protected with asphalt and special felt. In the Golfete of Coro crossing (6-km length and 6-meter depth), the line has a wall thickness of ½-in. grade x-46; is protected with asphalt and felt, gunited and anchored at 6-meter distances. Three pumping units (centrifugal vertical pumps of 1,850 hp each, moved by gas motors) are installed in Palmarejo (one as a spare unit). With a viscosity of 20 centistokes, two units working in series give a capacity of 235,000 b/d (570 psi discharge pressure); this capacity could be increased to 290,000 b/d (790 psi) with the three units working in series.

The *"Pagline"* is a 178-mile trunk line under construction for natural-gas transport from La Paz plant to Cardón refinery, laid parallel to and north of the "Lightline" route. The nominal diameter is 20 in., the wall thickness is $\frac{5}{16}$-in. grade x-52 in land sections (250 km), ⅜-in. grade x-46 in the "salinas" (18 km), ¾-in. grade "B" in the crossings of Lake of Maracaibo (8 km), Golfote of Coro (6 km), and rivers or sand areas (4 km). Certain land sections and all marine sections are protected against corrosion with bitumen; the marine sections are covered with gunite sheath 3 in. thick to avoid buoyancy. Without ini-

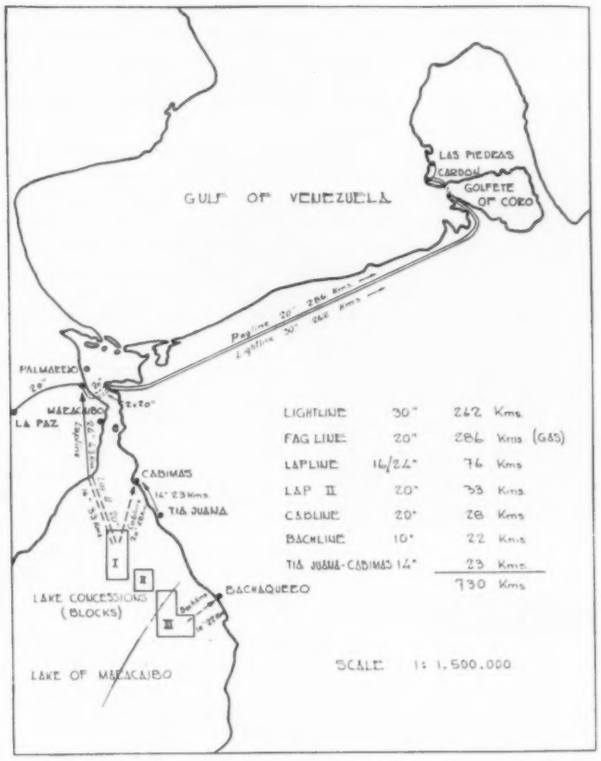


TABLE II

MENE GRANDE SYSTEM AREAS

Greater Oficina				
Oveja	Limon	Oficina	(Aguasay)	Merey
Nipa	Chimire	(Pelayo)	Ostra	Nueces
Mapiri	(Mata)	Ganso	Nardo	Soto
Zeta	Guara	Nubes	Boca	Zorro
Dación	Nigua	Fria	Zuma	Leona
Trico	Caico Seco	Mata		
Greater Anaco				
San Joaquin (El Roble)	(San Roque) El Toco	Santa Rosa (Rincon Largo)	(Guere) El Roble	Santa Ana
Greater Urica				
Quiamare	Cerro Pelado	La Vieja	Tácata	
Greater Santa Barbara				
Travieso (Tacat)	(Muri) (Mata Grande)	Mulata (Meyers "C")		

TABLE III

PRINCIPAL CRUDE PIPELINE SYSTEMS—MENE GRANDE OIL CO.

Eastern Venezuela

Trunk Pipelines:

From	To	Length Kilometers	Length Miles	Size (Inches)	Capacity (B/D)	12-31-56 Current Rate (B/D)	Pressure (PSI)
Oficina (Oficina crude, 18-39 API)	Anaco	59	37	16 / 16	267,000	,183,000	800
Anaco (Oficina blend, 18-39 API)	PLC	98	61	26	420,000	299,000	800
Anaco (Wax crude, 38-51 API) (Intermediate, 30-34 API)	PLC	98	61	16	132,000	135,000*	800
Travieso (Santa Barabara crudes, 25-40 API)	PLC	152	95	16	96,000	46,000	525

Lateral-Lines System:

*Looped with Travieso line.

	Size by Kilometers in Use					
	4-In.	6-In.	8-In.	10-In.	12-In.	16-In.
Total kilometers	9.6	32.7	140.2	175.5	75.4	86.4

Discharge Stations by Area:	12-31-55
Greater Oficina	59
Greater Anaco	30
Santa Barbara	4
Total	93

Principal Construction and Installations during 1956:

1. Installed eight 125-hp pumping units at the Anaco pumping station.
2. One 500-hp transfer pump at Puerto La Cruz.
3. Under construction during 1957, 35 km of 30-in. pipeline on Oficina-Puerto La Cruz trunk system.
4. During 1957, construction will begin on the fifth oil-loading berth at the Puerto La Cruz terminal.
5. During 1957, construction will begin on loading, storage, and pipeline facilities of LPGas from Santa Rosa to Puerto La Cruz.

TABLE IV

OIL-HANDLING STATISTICS—MENE GRANDE OIL CO.

Eastern Venezuela

	1955	1956
Number of tankers	1,135	1,303
Crude exported (barrels)	138,648,619	164,137,707
Products exported (barrels)	19,127,977	16,007,533
Total exports (barrels)	157,776,596	180,145,240
Crude exported (cubic meters)	22,043,504	26,095,926
Products exported (cubic meters)	2,802,049	2,545,006
Total exports (cubic meters)	24,845,553	28,640,932
	1955	**1956**
Average loading rate (barrels per hours):		
Crude	15,474	15,684
Refined	5,421	5,695
Average tanker liftings (barrels):		
Crude	147,551	145,911
Refined	94,958	87,202
Average turnaround time—Hours and minutes:		
Crude	22:28	24:39
Refined	40:54	38:09

During 1955, repairs required removing from service one berth at a time for a total of days aggregate time; hence figures above are below normal averages.

TABLE V

MAINLINE-STATION OPERATING STATISTICS—MENE GRANDE PIPELINE SYSTEM

Eastern Venezuela

	Oficina	Anaco	Travieso
Line capacity at 800 psi (b/d)	221,944	283,000	111,000
Heavy-duty pumps	6	7	3
Engines for pumps	6	7	3
Total horsepower	4,590	5,010	1,950
Generators and kilovolt-amperes, total	2—1,750	2—1,000	2—188
Engines for generators	2	2	2
Total horsepower	1,920	1,200	216
Current rate—February '56 (b/d)	183,000	195,000	42,500

tial pumping station and assuring a final pressure of 100 psi at Cardón, the nominal capacity of the line is 1,000,000 cubic meters per day. Raising the natural initial pressure of the gas by 650 psi (with pump station), the capacity should be increased to 3,000,000 cubic meters per day.

The *"Lapline"* is a 47-mile main gathering line for crude transport from lake concessions (block I) to Palmarejo tank farm. The submarine section (maximum depth of 21 meters) is 33 km, 16-in.-OD x $\frac{3}{8}$-in. wall thickness grade "B"; the land section is 43 km, 24-in.-OD x $\frac{5}{16}$-in. wall thickness grade x-42. As the pressure was already available from the existing lake block stations (800 psi), no provision was made for initial pumping facilities; and, with a 15-centistokes viscosity, the line capacity was 150,000 b/d. In order to increase this capacity, a second submarine line of 20-in. (Lap II) was laid parallel to the 16-in. line at a distance of 1,000 meters with $\frac{7}{16}$-in. wall thickness grade "B," allowing a total capacity of 340,000 b/d in the "Lapline" (800 psi). Both submarine sections are coated to combat corrosion, and covered with a 1½-in.-thick concrete sheath to provide negative buoyancy.

The *"Cabline"* will be a 17-mile submarine, main gathering line for crude transport from lake concessions (block I) to Cabimas tank farm, 20-in.-OD x $\frac{7}{16}$-in. wall thickness grade x-42, protected with asphalt, felt, and 30-in.-thick concrete. With a maximum pressure of 900 psi and

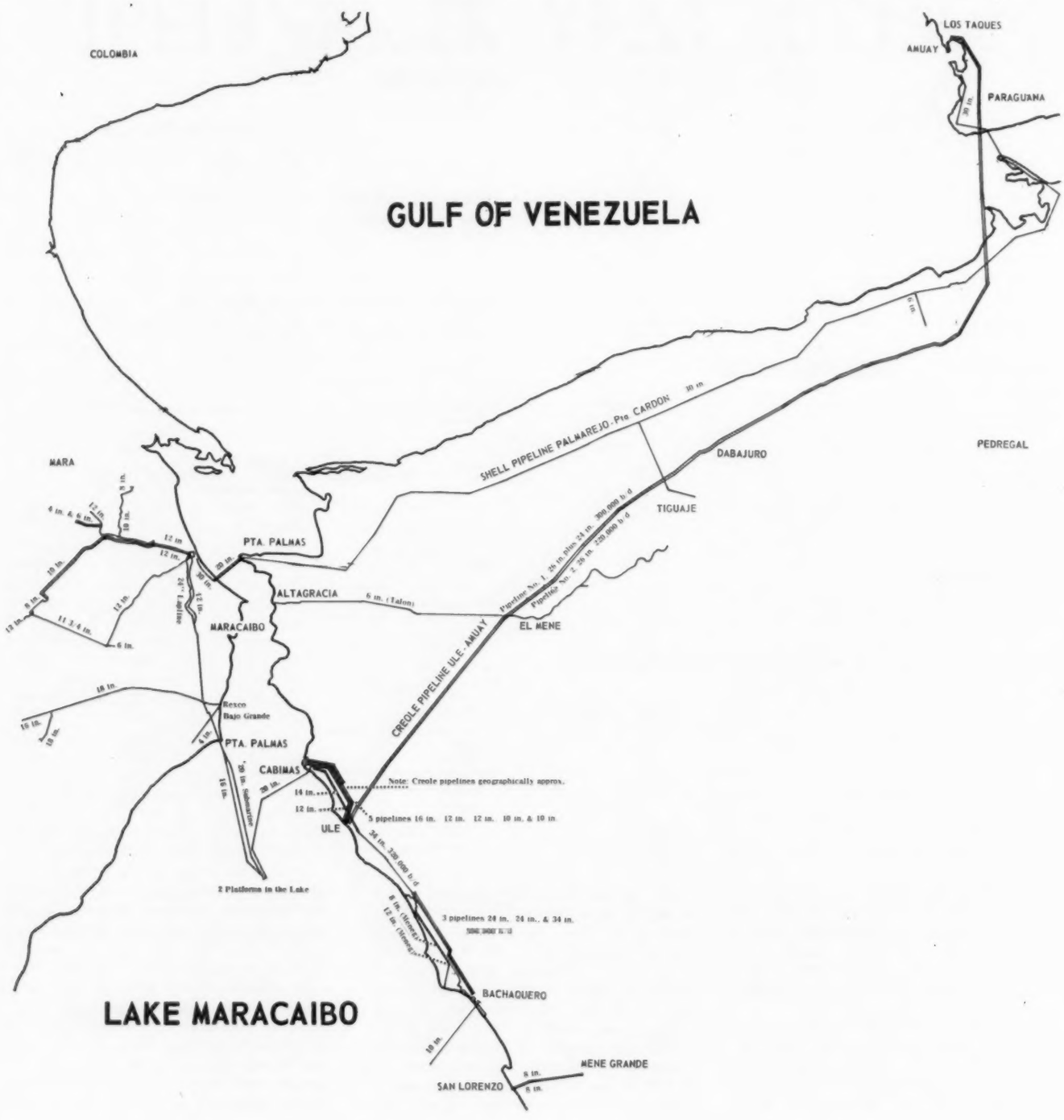
a viscosity of 12 centistokes, the capacity should reach 400,000 b/d.

The *"Bachline"* is a 14-mile gathering line for crude transport from lake concessions (block III) to Bachaquero tank farm. The submarine section is 20 km, 10-in.-ID x 5/16-in. wall thickness grade "B," protected with asphalt, felt, and 1-in.-thick concrete; the land section is 2 km, 12-in.-ID x 3/8-in. wall thickness. The actual capacity is 35,000 b/d (450 psi).

The line *"Tía Juana-Cabimas"* is a 14-mile trunk line for crude transport from the Tía Juana producing area to Cabimas tank farm. The line is 14-in.-ID x 3/8-in. wall thickness grade "B," with pump station driven by electric motors, and its capacity is 100,000 b/d.

Mene Grande's pipeline system is distinguished by the complex problems inherent in its operation. In the first place, although operated by Mene Grande Oil Co., the pipeline system is owned by the operator, together with several other oil companies. This ownership is divided between the Oficina-Puerto La Cruz trunk system and tank farms and the Travieso-Puerto La Cruz system. Also the lateral and discharge lines are owned in varying percentages by the operator and the other companies, with the exception of a few which are owned by nonparticipants in the trunk system who might be termed third parties.

The eastern Venezuela pipeline system is organizationally set up under the pipeline department of Mene Grande with principal headquarters at the ocean terminal on the north coast of Venezuela at Puerto La Cruz in the state of Anzoategui. While the administrative personnel is located at this point, the operational func-



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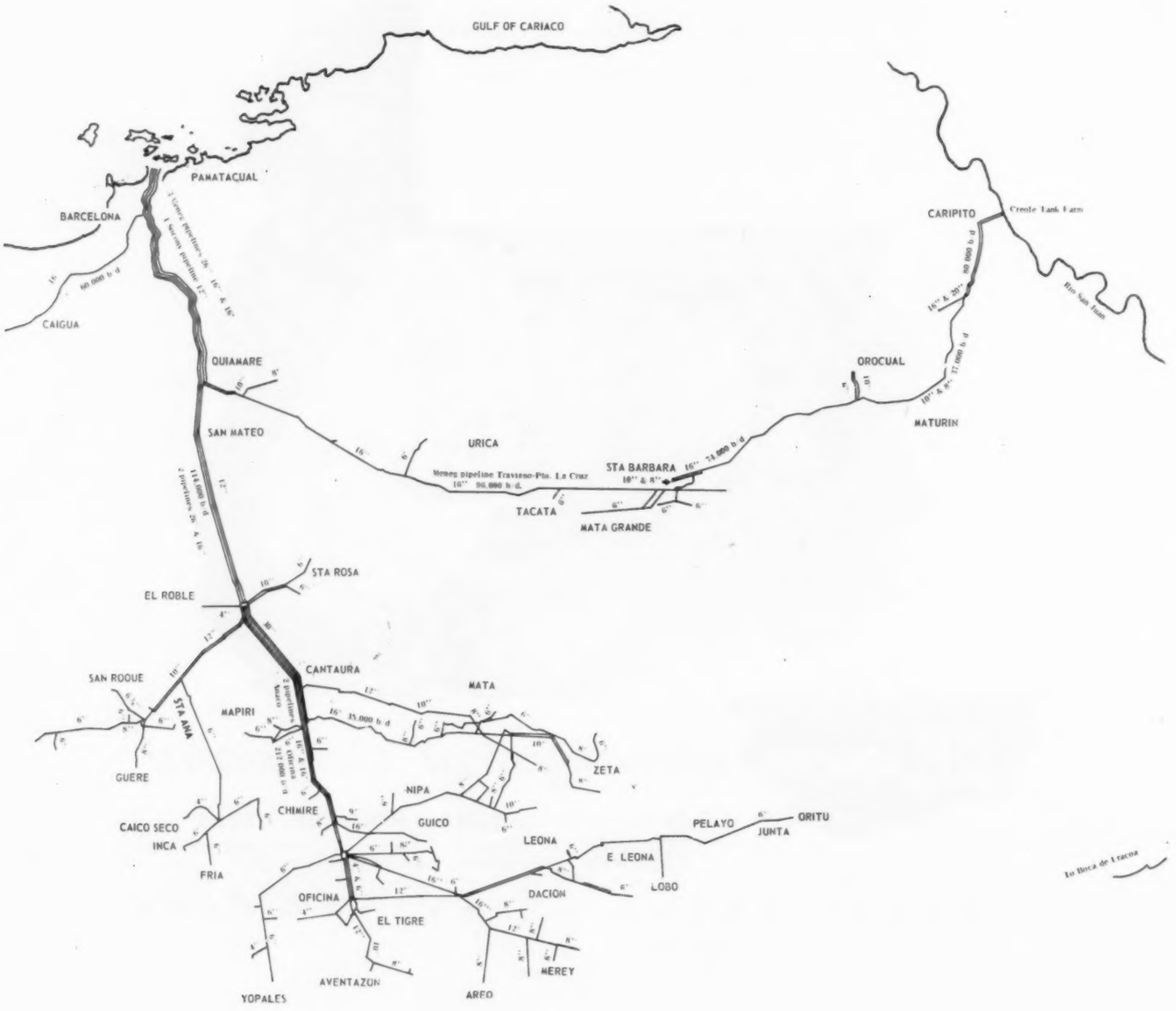
tions of the system are divided into geographical sections known as the Puerto La Cruz, Anaco, Oficina, and Travieso areas. In all areas other than Puerto La Cruz, the area supervisors are responsible for the operation and maintenance of discharge stations, discharge and lateral lines, and main pump stations which comprise their respective locations. The handling and moving of oil, as well as the loading of tankers at Puerto La Cruz and the overall movement of production in general, are under the supervision of the oil dispatcher, whose offices are also located in Puerto La Cruz. Dispatching duties include receipt and transmittal of shipping and lifting nomination cables, as well as the preparation of ships' papers for oil-export purposes. In addition to these oil-handling functions are a number of other responsibilities such as maintenance, material handling of imported cargo, and supervision of the docks and port facilities which are handled at Puerto La Cruz. These latter are under the jurisdiction of the area supervisor.

Geographic designations of the areas served by the pipeline system are: Greater Oficina, Greater Anaco, Greater Urica, and Greater Santa Barbara. Another area, which some day may be served by the system, is Greater Cascaroncito. Outlines of these areas are on the map; subdivisions of these larger areas into principal producing areas are as in Table II.

Names in parentheses represent third-party properties. The operational areas mentioned previously are much the same as these major geographic designations with a few minor exceptions. The pipeline facilities and pertinent statistics in connections therewith include the following:

Puerto La Cruz Terminal—Oil Dock: 2,106 ft long, consisting of four spills divided into four normal berths capable of handling four T-2 tankers, two T-2, and two supertankers, or three supertankers. All berths can load crude oil, and were recently equipped with a modern rubber fender system. Two berths are also equipped to load refined products. Maximum draft is 35 ft, and the average loading rates for crude oil per berth is 17,500 bbl per hour. The dock and tank farm are serviced by four transfer pumps, 2,500-per-hour Goulds, powered by 125-hp electric motors; one 9,000-bbl-per-hour Ingersoll-Rand, powered by 500-hp electric motor; and 11 gravity tanks. END



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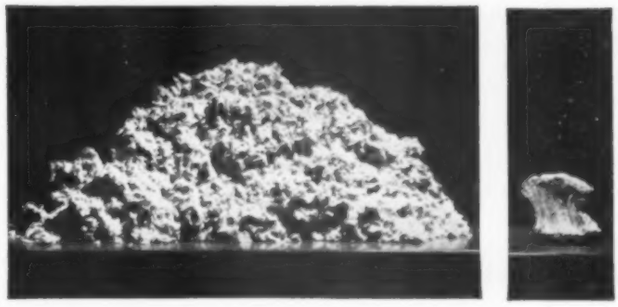

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EFFICIENCY DATA SHEET—PIPE SIZES 6" to 10" BORE.

HOT FACE TEMPERATURE °F.			400°F			600°F			800°F		
THERMAL CONDUCTIVITY K = B.Th.U. in./sq. ft. hr. in. °F.			0.43			0.47			0.53		
MEAN TEMPERATURE °F.			250			350			450		
Nominal Pipe Size	O.D. pipe	Thickness of Insulation	Heat Loss B.Th.U. sq. ft. hr.	Effic. %	Surface Temp. °F.	Heat Loss B.Th.U. sq. ft. hr.	Effic. %	Surface Temp. °F.	Heat Loss B.Th.U. sq. ft. hr.	Effic. %	Surface Temp. °F.
6"	6¼"	1"	135	87·7	126	233	90·6	167	354	92·5	218
		1½"	102	90·8	107	177	92·9	135	270	94·3	171
		2"	83·6	92·4	97	145	94·1	118	223	95·3	145
		2½"	71·8	93·5	91	125	95·0	107	192	96·0	128
		3"	63·5	94·2	86	110	95·5	100	170	96·4	117
		3½"	57·3	94·8	83	100	96·0	95	154	96·7	109
		4"	52·6	95·2	81	91·7	96·3	91	142	97·0	103
8"	8⅝"	1"	130	88·0	127	225	90·8	169	341	92·7	222
		1½"	97·7	91·0	108	169	93·1	137	258	94·5	174
		2"	79·2	92·7	98	138	94·4	120	211	95·5	148
		2½"	67·4	93·8	92	117	95·2	109	180	96·1	131
		3"	59·2	94·6	87	103	95·8	102	159	96·6	120
		3½"	53·2	95·1	84	92·7	96·2	96	143	96·9	111
		4"	48·5	95·6	82	84·6	96·5	92	131	97·2	105

These figures are compiled from results of official tests by THE NATIONAL PHYSICAL LABORATORY, TEDDINGTON, computed in accordance with formulae shown in BRITISH STANDARD SPECIFICATION appendices.

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Venezuelan Oil in World Markets

by **Bernard P. Leakey**

As the world's largest oil exporter, Venezuelan petroleum is particularly susceptible to changes in weather and the level of industrial activity. Over the years the pattern of Venezuela's exports has changed considerably – with increasing direction toward the Western Hemisphere and reliance on United States' markets, which her production complements so well. The future of Venezuelan exports remains bright, based on the heavy fuel-oil demand in important markets and rising world energy requirements.

IN 1928 Venezuela displaced Russia as the world's second largest oil-producing country. With the exception of a period during World War II, she has maintained that position ever since. Her crude production last year averaged nearly 2½ million b/d, equal to about 15% of the world total. With a population of only 6 million, and an economy which is still in relatively early stages of development, Venezuela consumes little petroleum herself—some 60,000 b/d at present (excluding ships' bunkers). The remainder is marketed abroad, a large proportion in the form of refined products. Venezuela has had an uninterrupted record for nearly 30 years as the world's largest petroleum exporting country.

The oil industry is by far the most developed and highly capitalized sector of the Venezuelan economy. It is the source of 93% of the country's exports by value, 70% of the foreign-exchange receipts, and 60% of the government's direct income. The economy of Venezuela is by no means a one-product economy, and development of other sectors such as cement and textile manufacturing, iron-mining, and agriculture is being pressed in order to diversify the base; but it is clear that the nation's prosperity is closely tied to the fortunes of world petroleum markets.

Although crude had been produced in commercial quantites since World War I, Venezuela's oil did not enter significantly into international trade until after 1922. In December of that year occurred the discovery which marked the beginning of the country's development as a petroleum producer of first rank. A wildcat drilled by Venezuelan Oil Concessions (a Shell-controlled company), on the eastern shore of Lake Maracaibo, blew in and flowed wild at a rate which reached 100,000 b/d before the well sanded up. The result was a rush by European and United States companies to explore and develop the area. Venezuelan crude production roughly doubled every year for several years after this discovery, climbing from 6,200 b/d in 1922 to 100,000 b/d in 1926. By 1929 it had reached 375,000 b/d, forming over 9% of total world crude production in that year. Development of the industry was accomplished under difficult conditions. Basic facilities such as roads and fresh-water supply were conspicuously lacking in western Venezuela that time; all the oil-field equipment and most of the camp supplies had to be brought in from overseas. A complete system of gathering lines, storage tanks, and loading terminals was built, and a fleet of shallow-draft tankers was acquired in order to get the oil out of Lake Maracaibo over the 12-ft-deep bar at its mouth.

The first shipment of oil from Venezuela was made by Carribbean Petroleum (another Shell affiliate) in 1917. With the large-scale development of the Venezuelan oil industry in the 1920's, there evolved a pattern of marketing, few features of which remain in evidence today. Nearly all crude production until the mid-1930's came from the Bolivar coastal fields on the eastern shore of the lake, where the famous Lagunillas, Tía Juana, and Bachaquero producing areas had been discovered. The intermediate destinations of a large part of Venevuelan production were then, as now, the Dutch island possessions of Curaçao and Aruba, which form part of the Netherlands Antilles, some 200 miles northeast of the entrance to Lake Maracaibo. Here were constructed large refineries which by 1929 were processing 70% of the Venezuelan crude output of 375,000 b/d. The refined products were shipped to markets in Europe and North America. It is because of of the close connection of the Aruba and Curaçao refineries with the Venezuelan petroleum industry (they operate almost exclusively on Venezuelan crude) that Netherland Antilles petroleum exports are usually grouped with those of Venezuela for analytical purposes.

Less than 20,000 b/d of Venezuelan crude output in 1929 was processed in Venezuelan territory. Another 90,000 b/d was exported as crude oil, mainly to refineries on the United States east coast. The remainder (about 265,000 b/d) was refined in Aruba and Curaçao. Thus, the bulk of Venezuela-Netherlands Antilles exports at that time consisted of refined products. European

TABLE I
PETROLEUM EXPORTS FROM VENEZUELA-NETHERLANDS ANTILLES—PERCENTAGE DIVISION INTO CRUDE OIL AND REFINED PRODUCTS

Year	Crude (%)	Products (%)
1938	21	79
1947	36	64
1948	39	61
1949	38	62
1950	35	65
1951	35	65
1952	37	63
1953	38	62
1954	41	59
1955	44	56
1956	46	54

and South American refining capacity was then relatively small, and those areas had litttle need for crude. Furthermore, the large discoveries in the United States during the 1920's gave that market an ample supply of domestic crude—foreign crude had a difficult time competing.

In the 1930's, Venezuelan crude production ceased to be exclusively of Bolívar coastal fields origin. Development of the industry in the eastern part of the country began after discovery of the Quiriquire field in 1928, followed by the Oficina, Jusepín, San Joaquín, and Temblador discoveries. Nevertheless, even by 1938, the production from eastern Venezuela accounted for no more than 16% of total Venezuelan crude output of 516,000 b/d. The Maracaibo basin has remained the principal source of Venezuela's crude throughout the history of the industry.

Domestic refining capacity continued to be small. There was a growing consciousness of the need for a Venzuelan refining industry as a logical step toward the country's economic development, and a start in this direction was made with the expansion of Shell's then existing plant at San Lorenzo to a capacity of 30,000 b/d and the opening of a 31,000 b/d refinery in the east at Caripito by Standard of Venezuela. However, in 1938, the proportion of Venezuela's crude processed within her borders still amounted to only 5%. It was not until after World War II that the real expansion of the domestic refining industry took place.

TABLE II
VENEZUELAN-NETHERLANDS ANTILLES OUTPUT OF REFINED PRODUCTS, 1956

	Thousands of Barrels Per Day	% of Total
Gasoline	172.5	12
Distillates	327.5	23
Fuel oil	828.7	59
Other (waxes, lubricants,etc.)	85.9	6
Total	1,414.6	100

A direct impact on the marketing structure was felt in 1932, when the United States placed import duties on petroleum—21 cents per barrel on crude and fuel oil, and $1.05 per barrel on gasoline. Imports of gasoline from the Netherlands Antilles were virtually eliminated, and imports of Venezuelan crude were nearly halved. Venezuelan production was not seriously affected. New markets for crude and products were sought and found, mostly in Europe—USA exports to these markets being displaced to a large extent in the process. The hoped-for rise in domestic USA price of crude proved to be quite temporary. Subsequenty, the duties were reduced through trade agreements.

By 1938, Venezuelan crude production averaged 515,600 b/d, 9.5% of total world production in that year. (It had thus grown in the 1930's at the same rate as production in the rest of the world.) The refineries in the Netherlands Antilles received 77% of this amount, and about 1% was consumed in Venezuela. The remainder was shipped mostly as crude to the United States, Europe, Latin America, Canada, etc. The outbreak of World War II in 1939 brought far-reaching changes in the marketing of Venezuelan oil, although not all were permanent changes. The immediate effect was a fall in production as many European markets were lost through blockade, submarine warfare, and restrictions by the belligerents on tanker movements. New outlets were found in partial substitution—in the growing demands of the USA defense preparations, in Canada and in Latin America, and there was a slow recovery of production. The entry of the United States into the war in December of 1941 brought the conflict close to Venezuelan shores. Heavy sinkings of tankers during 1942 intensified the general transportation shortage, which was entirely the cause of a fall of 35% in Venezuelan crude production in that year. Production began to rise again late in 1943, and then followed a steeply rising course to an average of 702,000 b/d in 1944 and 886,000 b/d in 1945 as the transportation situation recovered and the huge demands of the Allied war effort made themselves felt. Under a revised petroleum law passed in 1943, large areas of new concessions were granted in eastern Venezuela, the Maracaibo basin, and south of the Andean chain in the states of Barinas and Apure. With intensified exploration effort, the foundations of the great postwar boom were laid.

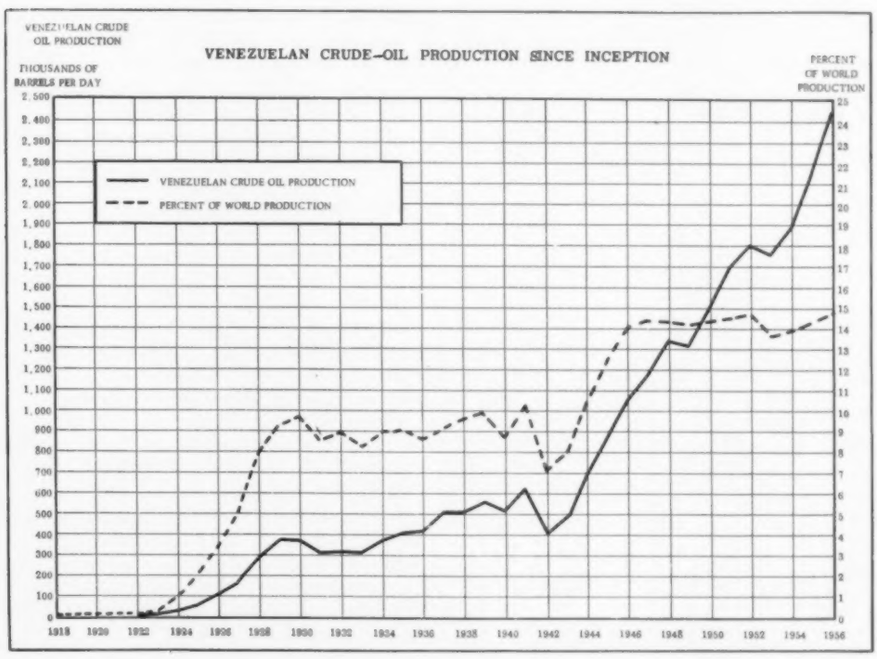
VENEZUELAN CRUDE OIL PRODUCTION
VENEZUELAN CRUDE—OIL PRODUCTION SINCE INCEPTION
THOUSANDS OF BARRELS PER DAY
PERCENT OF WORLD PRODUCTION
VENEZUELAN CRUDE OIL PRODUCTION
PERCENT OF WORLD PRODUCTION

TABLE III
VENEZUELAN CRUDE PRODUCTION SINCE INCEPTION

(Annual Average in Barrels per Day)

	Venezuelan Crude Production	% of World Production
1918	917	0.1
1919	830	0.1
1920	1,254	0.1
1921	3,980	0.2
1922	6,224	0.3
1923	11,495	0.4
1924	25,183	0.9
1925	55,405	2.0
1926	100,022	3.4
1927	171,691	5.0
1928	286,546	7.9
1929	374,924	9.2
1930	375,443	9.7
1931	319,762	8.5
1932	318,357	8.9
1933	323,981	8.2
1934	373,707	8.9
1935	407,075	9.0
1936	422,691	8.6
1937	509,087	9.1
1938	515,583	9.5
1939	562,834	9.9
1940	508,520	8.7
1941	624,979	10.3
1942	405,340	7.1
1943	491,575	8.0
1944	702,289	10.3
1945	885,917	12.5
1946	1,064,683	14.1
1947	1,191,037	14.4
1948	1,338,831	14.3
1949	1,321,295	14.2
1950	1,497,890	14.4
1951	1,704,621	14.5
1952	1,804,702	14.7
1953	1,765,864	13.7
1954	1,896,283	13.9
1955	2,157,861	14.2
1956	2,457,933	14.8 (Est.)

The rapid wartime growth of the Venezuelan petroleum industry continued unabted into the early postwar years. Indeed, as shortages of material and equipment eased progressively, development of the areas conceded in 1944 and 1945 proceeded apace. Crude production rose strongly—by 20% in 1946 and 12% in both 1947 and 1948, reaching 1,339,000 b/d in the latter year. It faltered only in 1949 and 1953 owing to conditions of demand in the USA market; but for the past 10 years it has growing at an average annual rate of 8.7%, slightly higher than the rate for the whole world.

In a country like Venezuela, which produces mainly for export, crude production and exports generally move in parallel, and the principal determinant of the level of both is the demand in foreign markets. The postwar growth in Venezuelan production took place under the stimulus of a strong world demand for energy in general and for petroleum in particular. Reconstruction and booming economies over most of the period underlay this demand, which in some areas was accentuated by a shift to petroleum from other energy sources. Short-term fluctuations in Venezuelan production are almost always the reflection of fluctuations in the strength of demand in her major markets. It is worth noting that the impact of a falling demand tends to be greater than that of a rising demand. This is because development programs are set well in advance, and planned rates of production cannot be far exceeded to meet unexpected strengthening of demand in the short term. On the other hand, a sharp falling off in demand is almost immediately reflected in closed-in production and postponement of development effort. This happened in 1948 and 1949. Temperatures in the United States, the most important customer for fuel oil, were unseasonably warm during the winter months of 1948-1949. At the same time, signs of a minor recession or economic readjustment began to appear. Venezuelan crude production fell sharply from 1,383,000 b/d, in October 1948, to 1,155,000 b/d in March 1949—a drop of 17% in five months. Moreover, it was a break in a rising trend during a season of usually high demand. Exports reacted in a similar manner. A steady recovery took place during the rest of 1949, as business conditions improved and normal weather reasserted itself in the United States.

BERNARD P. LEAKEY was graduated by London University in 1948, with a bachelor of commerce degree; and by Georgetown University, Washington, D.C., in 1955, with an M.A. in economics. He joined Creole's Petroleum Economics Department in March 1956. Previously he had been with the commercial section of the Embassy of India, in Washington.

As indicated by this experience, two of the most important influences on the demand in markets for Venezuelan petroleum (at least, in Europe and North America) are weather and the level of industrial activity. This would be true for almost any large producing country, but for Venezuela these factors are of overriding importance because of the nature of Venezuelan crude. It is characteristically of a heavy type, with low sulfur content, favoring the refining of the heavier products used primarily for heating and power generation. In 1955, 27% of Venezuelan crude production had a gravity of less than 20 API; 45% was between 20 and 30 API; and 28% above 30 API. By comparison, the average gravity of Middle East production is about 34 API. Heavy fuel oil comprises 60% of the total products exported from Venezuela and the Netherlands Antilles. The large volume of product exports to the United States consists almost entirely of heavy fuel oil. Venezuela remains the principal source of heavy crude and fuel oil entering international trade. This has been of considerable significance in the postwar period, when a rapidly rising need of fuel oil has been witnessed in many areas, and it also accounts for Venezuela's retaining a sizeable part of the European market despite competition from the Middle East.

The principal types of Venezuelan crude now exported are general-purpose and fuel product types such as Tía Juana medium, Guanipa and Lagomar; types valued for their asphalt content such as Langunillas and Bachaquero; and wax-bearing types such as San Joaquín. Crude as such now forms a much greater part of Venezuelan-Netherlands Antilles petroleum exports than it did before the war.

It will be observed from Table I that the proportion rose from 21% in 1938 to 46% in 1956. The main reasons are the large refinery construction and, consequently greater demand for crude which occurred in other parts of the world, particularly in Europe and Latin America, and the fact that the growth of Venezuelan crude production has far outstripped the growth of refinery capacity in Venezuela and the Netherlands Antilles. No important refinery construction has taken place in Aruba or Curaçao in recent years, but the figures in Table I completely conceal the effects of the large expansion of Venezuelan capacity—a development which deserves some comment.

The 1943 Law of Hydrocarbons provided a stimulus for this expansion. Although some increase in capacity had already taken place with the building of refineries in eastern Venezuela by Standard Oil of Venezuela (now Creole Petroleum Corp.) and the Texas Petroleum Co., the Venezuelan government made it clear in 1943 that the granting of new concessions would depend partly on the applicant's willingness to refine crude within the country's borders. Both Creole and Shell, as soon as materials were available after the war, began construction of installations at Amuay Bay (Creole) and Punta Vardón (Shell) on the Paraguaná peninsula to the northeast of Lake Maracaibo. These two refineries, still being expanded, have a combined crude capacity of about 394,000 b/d, equal to 64% of total Venezuelan refining capacity. Other refineries constructed after the war include Venezuelan Gulf Refining Co.'s (57,000 b/d)

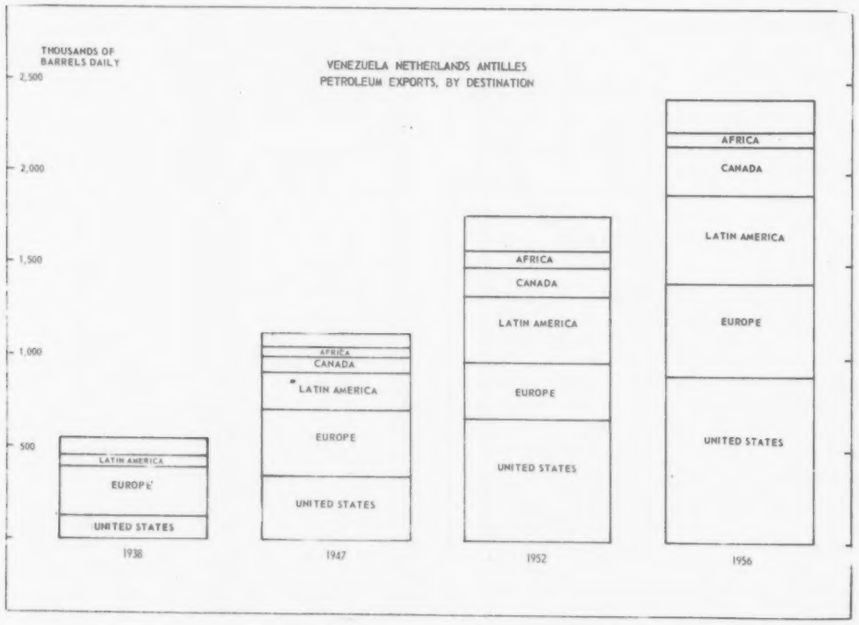

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TABLE III

VENEZUELAN-NETHERLANDS ANTILLES EXPORTS OF PETROLEUM

(Thousands of Barrels Per Day)

Destination	1938 Crude	1938 Products	1938 Total	1947 Crude	1947 Products	1947 Total	1952 Crude	1952 Products	1952 Total	1956 Crude	1956 Products	1956 Total
USA	64.7	71.6	136.3	218.5	140.8	359.3	337.0	332.9	669.9	450.5	456.4	906.9
Canada	6.6	—	6.6	77.1	9.3	86.4	139.4	16.5	155.9	214.8	39.5	254.3
Latin America	1.9	67.5	69.4	26.1	177.8	203.8	87.5	279.8	367.3	204.2	280.6	484.8
Europe	41.4	211.0	252.4	80.2	273.7	353.9	75.9	222.9	298.8	228.4	274.5	502.9
Africa	1.3	36.4	37.7	6.9	39.9	46.8	7.0	81.0	88.0	12.2	76.0	88.2
Bunkers	—	35.2	35.2	—	69.5	69.5	—	99.6	99.6	—	125.0	125.0
Whalers	—	9.5	9.5	—	5.5	5.5	—	7.5	7.5	—	8.5	8.5
Other[1]	—	0.7	0.7	—	3.1	3.1	12.4	70.2	82.6	3.3	39.0	42.3
Total	115.9	431.9	547.8[2]	408.8	719.6	1,128.4	659.2	1,110.4	1,769.6	1,113.4	1,299.5	2,412.9
%												
USA	56	17	25	53	20	32	51	30	38	40	35	38
Canada	6	—	1	19	1	8	21	2	9	19	3	10
Latin America	2	15	13	6	25	18	13	25	20	19	21	20
Europe	36	49	46	20	38	31	12	20	17	21	21	21
Africa	1	8	7	2	6	4	1	7	5	1	6	4
Bunkers, Whalers, Other[1]	—	10	8	—	11		2	16	11	—	14	7

[1] Far East, Middle East, US armed, unknown destinations.

[2] The Netherlands Antilles refineries received a small amount of crude from non-Venezuelan sources at this time.

at Puerto La Cruz on the north coast of eastern Venezuela, and Sinclair's (35,000 b/d) at nearby El Chaure.

Venezuela and the Netherlands Antilles together produced an average of 1,400,000 b/d of refined petroleum products in 1956. This output consisted of the main categories indicated in Table II.

The emphasis on the heavier products is apparent. However, a complete range of products is produced—including aviation gasoline, jet fuel, motor gasoline, diesel oils, asphalts, and lubricating oils.

The three chief markets for Venezuelan-Netherlands Antilles crude and products are now, as in the past, North America, Europe, and Latin America; however, there have been important shifts in the relative importance to Venezuela of these markets. One such change, the rearrangement of trade after the USA tariff of 1932, has already been mentioned. More recent changes may best be described by reference to Table IV on exports by destination in representative years. (There was some distortion of the marketing pattern in the last two months of 1956 by the Suez crisis, but its effect on the 1956 annual average was not so great as to invalidate comparisons.)

In 1938, European countries formed the largest market for Venezuelan-Netherlands Antilles petroleum exports, taking 46% of the total of 550,000 b/d. This area was more important as a products market than as a crude market, being the destination of 36% of the crude and almost 50% of the much greater volume of product exports. The United States was the best customer for Venezuelan crude, taking 65,000 b/d, or 56%. Relatively minor amounts of crude were sent elsewhere other than to Europe and the United States; refining capacity in Latin America and Canada was small in 1938. However, Latin America was the market for a considerable volume of products. The destination "Africa" includes the important bunkering stations in the Canary Islands, the Cape Verde Islands, and the Azores, and most of the 38,000 b/d sent to this region consisted of bunker "C" fuel oil. About the same volume of bunker fuel was sold to tankers and other vessels at Venezuelan and Netherlands Antilles ports. A substantial business, 10,000 b/d, was done in the bunkering of ships on their way to the south Atlantic whaling grounds.

By 1956, total exports had grown to 2,400,000 b/d, divided between crude and products in roughly equal amounts. The United States was still the best customer for crude, but otherwise the marketing pattern bore little resemblance to that of 1938. Marked changes took place over the period in the status of areas as customers for Venezuela-Netherlands Antilles petroleum exports, changes which were mainly due to two factors—refining trends in the major markets and the rapid rise of petroleum exports from the Middle East. The latter was the principal reason for the decline of Europe's share in the total of Venezuelan-Netherlands Antilles exports from 46% in 1938 to about 20% in 1956. Postwar currency difficulties in many European markets enabled sterling crude and products from the Middle East to displace hard-currency oil such as Venezuelan. The Middle East now supplies 75% of Europe's petroleum needs. The large expansion of European refining capacity, coupled with the intensified demand for fuel oil, has modified this radical change to some extent in recent years by stimulating the import of specialized Caribbean crudes. Product imports from Venezuela and the Netherlands Antilles, which have changed little in volume despite the great growth in European demand, are now principally confined to fuel oil and the heavier distillates.

The United States is now the largest market for both crude and products. A strong growth has occurred in product imports—particularly fuel-oil imports. USA practice is to refine for maximum yield of light products, and there is ample cracking capacity for the purpose. The percentage of heavy fuel oil in total USA output of refined products is falling for this reason. Although fuel-oil demand in the United States is rising quite slowly—by about 1% annually—imports of the product, of which the Caribbean is the most important supplying region, have increased considerably in recent years. This is the chief explanation of the sixfold increase in Venezuela-Netherlands Antilles exports of products to the United States. The 1956 level was about 460,000 b/d, nearly all of it fuel oil. Exports to the USA of Venezuelan crude have risen to almost the same level, stimulated by record levels of demand. However, while the USA share of total Venezuelan-Netherlands Antilles products has gone up—from 17% in 1938 to 35% in 1956—the USA share of Venezuelan crude has fallen—from 56% in 1938 to 40% in 1956.*

Latin America is an area in which the impact of refinery construction on petroleum trade is marked. This region took virtually none of Venezuela's crude in 1938, but a significant amount of Venezuela-Netherlands Antilles products (about 68,000 b/d, or 15% of total product exports). Postwar refinery construction has made Latin America a customer for nearly 20% of Venezuela's crude—about the same size market as Europe. The region's share in the products has also gone up, rising in volume to close to 300,000 b/d. Latin America, with its fast-developing economies, is indeed a petroleum market of considerable promise.

Canada has attained a notable importance as a Venezuelan crude customer. Large refineries in the eastern provinces operate on imported crude—since, in the absence of completed pipeline facilities, there is no economic way for crude from Alberta to reach them. Canada now takes 19% of Venezuela's crude exports, about half as much as the United States' offtake and

* This, of course, is explained by the fact that total Venezuelan exports of crude have increased far more rapidly than total Venezuelan-Netherlands Antilles exports of products—by 10 times as against 3 times for products. It may be noted parenthetically that USA imports of crude from the Middle East have increased at a much steeper rate than those from Venezuela.

(*Continued on page 178*)

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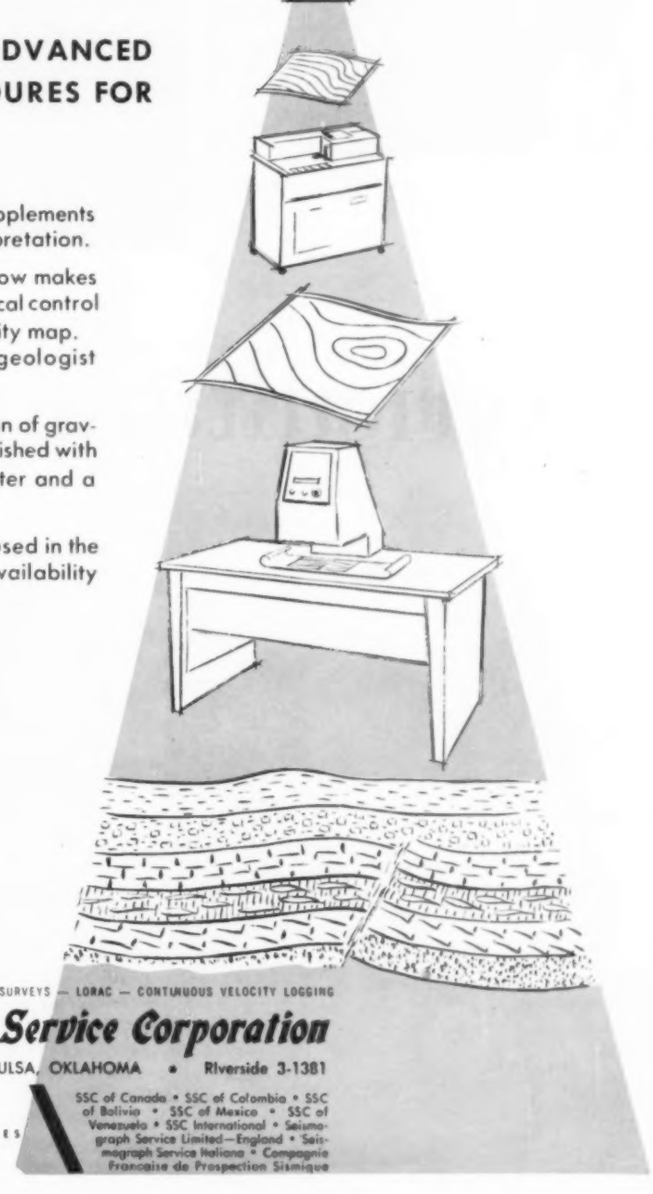

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Hungarian refugees recently arrived in Venezuela—Refugiados Hungaros recientemente llegados a Venezuela.

Agricultural Development

Investment of oil revenues in far-reaching irrigation projects, coupled with a carefully selective immigration policy, are raising Venezuela's food production and reducing dependence on imports.

PRESENT irrigation systems in Venezuela are under the management of the National Agrarian Institute, transferred in 1925 from the Ministry of Public Works. They are located in the states of Sucre, Miranda, Carabobo, Cojedes and Trujillo, and are known as "El Tuy", "Suata Taiguaiguay", "San Carlos" and "El Cenizo". They cover an area of 29,146 acres. On its part, the Institute has built on its unities, centers and colonies special irrigation systems, the most important of them being that at Unidad Agrícola de Turén (Turen Agricultural Unity). This system includes 117 deep wells and a system of canals or ditches with a total length of about 180 miles. At present, practically the entire area of this unity is being irrigated by this system. On the other hand, the Ministry of Agriculture and Livestock, of which the Institute is a dependency, has undertaken the canalization of the Río Guárico irrigation system also built by the Ministry of Public Works. This system will have a minimum irrigation capacity of 271,700 acres.

The largest irrigation system so far planned by the Venezuelan government is now under study. It will cover a much greater area than the Guárico system, along the slopes of the Andes Mountain Range in the states of Trujillo, Barinas, Portuguesa and Apure and will be known as the "Boconó-Masparro" irrigation system. It is presently under joint study by the Ministry of Public Works and the Ministry of Agriculture and Livestock.

This vast irrigation program supplements the agrarian reform program which has been under way in this country for some time. The most outstanding among these reforms are the Unidad Agrícola de Turén and Unidad Agropecuaria de Los Andes (Turen Agricultural Unity and The Andes

Turen Irrigation System.—Unidad Agricola de Turen.

Agricultural and Livestock Unity) conducted by the National Agrarian Institute, and the Río Guárico irrigation system directly under the auspices of the Ministry of Agriculture and Livestock. In addition to these projects, the Institute has reorganized and established about 20 small and medium size colonies where immigrant and native families work together in a composite colonization system which has been proved to be most effective for the realization of this program. It is for this reason that the Institute, pursuant to orders from the Venezuelan government, has been careful in the selection of the immigrants who have been entering the country since its creation. For this purpose, it maintains Immigration Missions in Italy, Germany and Spain in order to carry out more effectively the government's instructions on controlled immigration.

All of these activities, which benefit the country both by bettering the human factor and the national economy, are the natural result of the growth of the petroleum industry developed by foreign capital—American capital in particular. The present Venezuelan government headed by General Marcos Pérez Jiménez, being conscious of its duties, has endeavored to invest a large part of this mineral wealth in the transformation of the physical means by creating productive enterprises, among them those based on cattle production. By this activity, the Institute, through its colonies, has raised the production index of some crops which until recently were inadequate, some of them having already surpassed the national demand, such as rice and corn, and others such as benne or sesame, potatoes, etc., which also have reached a high figure.

Through Mineral Wealth

Deep water well in Turen irrigation system.—Pozo profundo en la Unidad Agricola de Turen.

Irrigation canal in one of the systems administered by the National Agricultural Institute.—Canal de riego en uno de los sistemas que administra el Instituto Agrario Nacional. →

Lower costs, stiffer concession terms for refining, and mounting needs are boosting refinery construction as . . . .

Venezuelan Refineries Expand

WHEN construction now underway is completed during 1958, Venezuelan refining capacity will have reached 874,000 b/d. This is about double capacity five years ago and if the present trend continues it will be up to nearly 1,000,000 b/d in 1960, or three times over 1951 levels.

Some of the explanation for the rise lies in comparative costs. Five years ago it cost approximately 50% more to build a refinery in Venezuela than it did in the United States. There is still a cost differential but it is less now, running about 25% over U.S. levels.

Still another reason lies in the government's firm desire to see Venezuelan crude refined in Venezuela, so far as possible. In recent concessions the minimum which could be refined in Venezuela was put at 15%, up from 10% in previous years. There was an additional 8% royalty put on oil produced from the new concessions which was refined in "areas not consuming centers," a provision aimed directly at the Dutch West Indies which for many years have had large plants refining Venezuelan crude. Some of the new concessionaires will refine larger shares of crude in the country, since they offered to do so as part of their concession bids. Not all will build their own plants, since the law does not require that, only that the crude be refined whether by the producer or someone else.

Principal refineries in the country are as follows:

Compania Shell de Venezuela operates two refineries having a total crude-oil processing capacity of 248,000 bbl per stream day. These refineries are located at San Lorenzo, on the east coast of Lake Maracaibo, Estado Zulia; and at Punta Cardon, a deep water terminal on the Paraguana Peninsula, Estado Falcon.

San Lorenzo: The San Lorenzo refinery first came onstream in 1917. It has been expanded and modernized on several occasions, and now has a capacity of 45,000 b/d provided by two atmospheric distillation units. Intake to the refinery consist of crudes from the nearby Mene Grande field of CSV, and from the Tarra field of Colon Development Co. southwest of Lake Maracaibo.

Production consists of gasoline, treated industrial solvents, kerosine, gas oil and fuel oil, for consumption in the local market and export. Terminal facilities are adequate for ocean tankers.

Cardon: Cardon refinery is an integrated refinery of 203,000 b/d rated capacity, initial construction of which was commenced in 1945.

Crude intake capacity is provided by two two-stage distillation units, one atmospheric distillation unit, and two Dubbs cracking units.

Reforming capacity is provided by an 8,700 b/d thermal reforming unit.

Processing facilities for light products include a gas separation unit and a mixed C_3-C_4 polymerization plant. Soda-washing units and a doctor-treater are provided for treating the cracked gasolines before blending.

The refinery has a lube-oil manufacturing capacity of some 3,000 b/d of HVI lube oils. The lube-oil refining complex consists of a 19,000 b/d high vacuum-distillation unit, the distillates from which are treated in a furfural solvent-extraction unit and the residue in a propane deasphaltizer. The latter units are followed by MEK solvent dewaxing, clay contacting, and a blending and filling installation.

The latest refinery extension, the cat cracker complex, is now nearing completion. Scheduled to go onstream in August 1957 is a 35,000 b/d fluid catalytic cracker of the latest design, together with twin high vacuum-feed preparation units. A second gas separation unit is being constructed to process the cat cracker gases. An HF alkylation unit, a second polymerization unit, soda-washing units, and a solutizer gasoline treater complete the complex.

A full range of products is available for the local market and for export; LPGas, motor gasoline, aviation turbine fuel, kerosine, gas oil and diesel, fuel and lubricating oils. Aviation gasoline also will be produced when the present extensions are completed.

Preliminary work has been started on an 80,000 b/d two-stage crude-distillation unit, which is scheduled to go onstream by mid 1958. This unit will raise the refinery intake capacity to 283,000 bbl per stream day.

Cardon refinery is linked with the producing areas of the Maracaibo region by a 160-mile 30-in.-diameter pipeline of 325,000 b/d capacity. Through this line light crudes are received for refinery intake and export. The heavy Bolivar coast crudes are shipped to the refinery by the CSV fleet; the latter comprises 10 tankers with a total deadweight tonnage of 79,000, eight of which are in crude and fuel-oil service and two in the coastal trade with white products.

At present under construction and expected to be completed by mid-1957 is a 160-mile 20-in.-diameter gas line which will transport natural gas from the La Paz field in the Maracaibo district to be used as fuel gas at Cardon. The capacity of this line will be some 100,000,000 cu ft per day.

Shipping accommodation at Cardon consists of three jetties with a total of six

Cardon Refinery, Cia. Shell de Venezuela: View of crude distiller No. 2, high vacuum plant and asphalt burning plant.

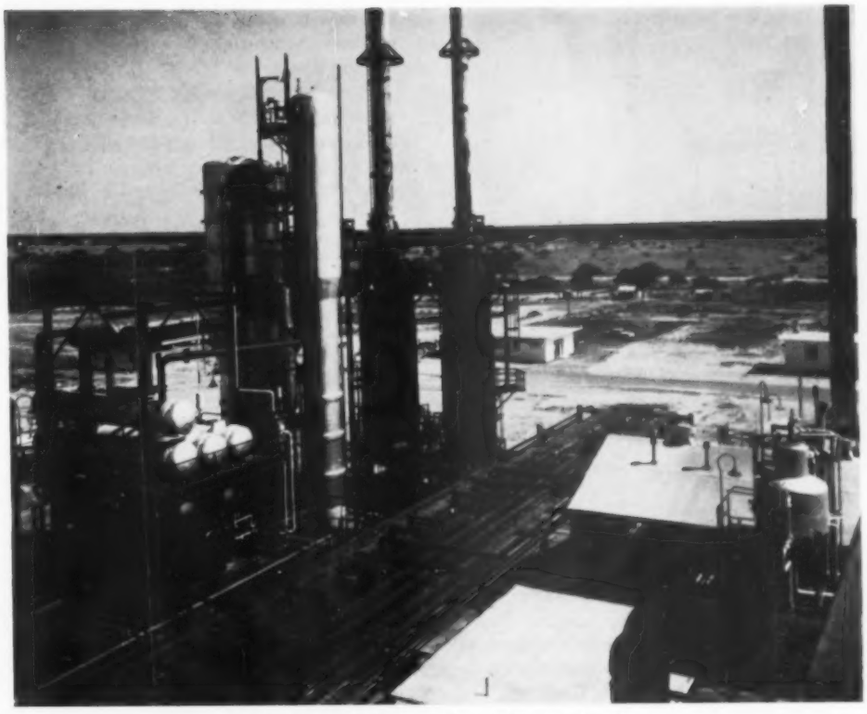
ocean tanker berths, some of which cannot accommodate supertankers, and four berths for coastal tankers. Construction of a fourth jetty to accommodate supertankers will shortly be commenced.

The Cardon refinery is located on the Paraguana Peninsula, where it has been necessary to provide very extensive auxiliary services not only for the refinery, but also for the 4,000 persons who work there. Fresh water is piped from the mountains 55 miles away, and electricity is supplied from the refinery's 42,500-kw generating plant.

Alongside the refinery is the residential area built by the company for employees and their families, which caters for all the essential requirements of the community with churches, schools, medical facilities, stores, cinema, and commissary.

*Amuay Bay Refinery:** The Amuay Bay refinery of Creole Petroleum Corp. is situated on the Paraguana Peninsula in western Venezuela. Construction at the refinery site was started late in 1946, and the first pipe still with a rated capacity of 60,000 b/d went onstream in January 1950. Further development of this modern oil center by Creole has proceeded rapidly since that time, and today it consists of a 250,000 b/d refinery and a 500,000 b/d deep-water terminal. Because of the isolated location, complete maintenance facilities are provided, and a modern community is being developed for the refinery employees—based on the philosophy of home ownership rather than the traditional oil camp.

Crude from two pipelines is received into the crude shipping terminal and refinery feed tankage which has a total inventory capacity of about 3.6 million barrels. Four crude segregations are handled on a routine basis, with the largest volume being Tia Juana medium-crude. About 250,000 b/d are processed by Creole in the Amuay Bay refinery, and the remaining 270,000 bbl from the pipelines are loaded into tankers from the crude shipping terminal for export. Most of the refined products are also shipped by tankers to the local and export trade.



Bajo Grande Refinery, Richmond Exploration Co.

The normal crude run of 250,000 b/d is processed in three crude-distillation units. Two of the three crude units are two-stage pipe stills; and the third crude unit, which was placed onstream in August 1956, has only an atmospheric stage. The three crude units are all similar in design, and much of the process equipment is identical.

A portion of the virgin naphtha from the crude units is fed directly to a naphtha fractionator and stabilizer unit. This 20,500 b/d unit is used primarily to prepare feed for the 11,100 b/d fluid hydroformer and for stabilizing virgin naphtha for gasoline blending.

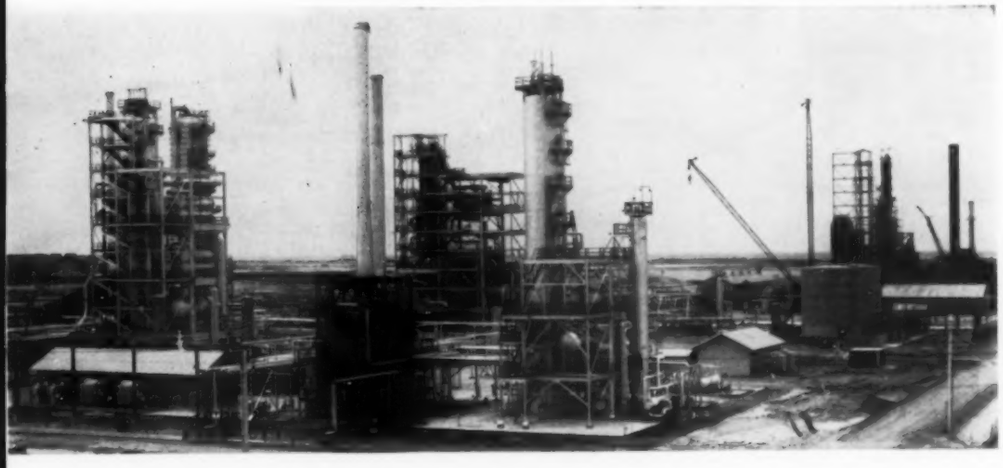
Kerosine side streams from the crude units are caustic-washed and sent to tankage for subsequent sale or blending into finished products. Light gas-oil side streams are also caustic-washed and sent to tankage. Heavy gas oils are sent directly to tankage.

The bottoms product from the crude units is blended to a Saybolt furfural viscosity of 175 sec at 122 F by automatic viscosity control of diluent injection. After blending to finished product viscosity, and cooling to 135 F, the material is sent to storage in the products shipping terminal.

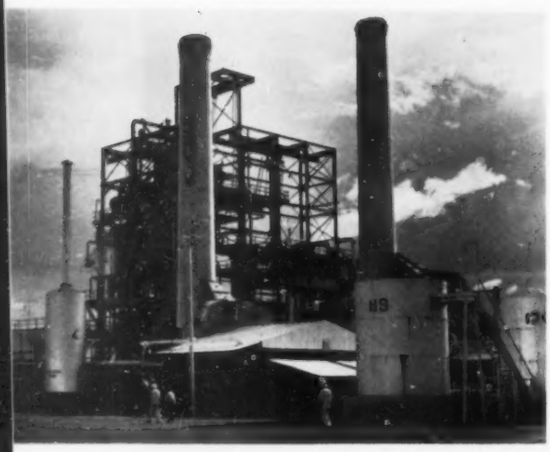
The vacuum stages of the tw-stage crude units were designed to complete the reduction of medium crude to a 29% heavy product. Normally, No. 1 crude unit runs two blocked operations. The fuel-oil operation, which is run about 85% of the time, has been described above. The rest of the time, the unit produces asphalt, lube distillates, and light fuel products. The remaining two crude units run essentially constant on a fuel-oil operation. Asphalt from No. 1 unit is sold as penetration-grade, or is blended into cutback asphalts and various oxidized specialities. Oxidized asphalts are produced in a 400 b/d bath-type asphalt oxidizer, and usually shipped to market in drums.

The fluid catalytic hydroformer was designed to process 11,100 b/d of a 200-300 F virgin naphtha and to produce 98 Research octane hydroformate. The hydroformed product, after stabilization, is split into three cuts in a series of three distillation columns, which produce well fractionated light hydroformate, aviation aromatics, and heavy hydroformate.

Amuay Bay Refinery, Creole Petroleum Corp.



*Information contributed by Jesse B. Jackson, Jr. of Creole Petroleum Corp.



Caripito Refinery, Creole Petroleum Corp.

Except for gasolines, finished products at Amuay are continually blended directly from streams as produced on the crude-distillation units. Various combinations of kerosine and light gas oil are blended into heating oils and diesel oil. Gasolines are batch-blended from the various components upon demand and stored for shipment in the products shipping terminal.

Gross product storage of 18 million barrels is provided in the products shipping terminal, of which 13.5 million barrels capacity is used for 175-viscosity fuel oil.

Of particular interest is the use of earthen reservoirs for the seasonal storage of 175-viscosity fuel oil, to meet peak seasonal demands, and to maintain producing and refining operations at a uniform rate throughout the year. These reservoirs are filled during the winter months when demand is high. The first reservoir, constructed in 1955, has a capacity for 3.5 million barrels of fuel oil. The second, having a capacity of 8.8 million barrels, was completed in 1956. The per-barrel cost of reservoir capacity is very low—being about ⅛ the cost of steel tankage. Experience in using the reservoirs has shown very low oil loss experienced, and no significant changes in physical properties of the oil in spite of the reservoirs being open to the air.

In 1956, total oil movements across the dock at Amuay averaged 520,000 b/d. During the peak month of December 1956, movements averaged 658,000 b/d. Product and crude shipping tanks are located in the upper refinery area, and loading pumps are centralized in the lower area. The difference in elevation provides about 75 ft of suction head for the loading pumps.

The crude-loading terminal tanks are manifolded to four 25-in. crude-loading lines, which in turn are manifolded to six pumps in the lower area pumphouse. These pumps have a capacity of 10,000 bbl per hour each, and are paralleled to obtain the desired loading rate. The record crude-loading rate of 27,200 bbl per hour net was achieved in September 1953. Average loading rate is about 15,000 bbl per hour for crudes when using two pumps and one loading line.

Products, except for fuel oil, are loaded with smaller pumps and lines. Fuel oil is loaded from steel tankage through either of the two 24-in loading lines using pumps identical to those used for crude. Shown in Table I are the normal average loading rates for the Amuay terminal.

TABLE I
Tanker Loading Rates

	Barrels Per Hour
Aviation gasoline	1,500
Motor gasoline	9,000
Heating oil	8,500
Diesel oil	8,500
Fuel oil	11,000[1]
Grade	15,000[2]

[1]Two ships can be loaded simultaneously at this rate.
[2]Three ships can be loaded simultaneously at this rate.

Port facilities at Amuay are adequate for docking six ocean-going vessels and two shallow-draft vessels simultaneously. Shallow-draft vessels (25-ft) are handled at a barge dock when the deep-water piers are occupied.

Power-generation facilities are located within the refinery process area in a single power house from which feeders run to the outlying consuming districts. There are three 600 psig steam boilers with a total sustained capacity of 560,000 lb of steam per hour and a 24-hour peak capacity of 620,000 lb per hour. Electrical generation utilizes 600 psig steam in three identical 7,500-kw turbo-generators on an extraction condensing cycle. Steam to process areas is supplied at 600 psig, 150 psig, and 15 psig through steam mains throughout the refinery area. Electricity is distributed at 13,800 volts to various transformer substations in the remote areas. Net makeup water to the boilers is supplied from a conventional hot lime-zeolite treating plant and a multiple-effect sea-water evaporation unit. Condensate is returned to the power house from almost all users of steam.

Sea water is used for all process cooling purposes at Amuay. Five 16,500 gpm motor-driven vertical pumps are located on the bay, which pump salt water to the refinery process area through two 48-in. water lines. Normal process water usage is about 55,000 gpm. Process water returns to the bay by gravity flow after having passed through an API separator and secondary settling basin for removal of oil contaminants.

Maintenance shops and warehouse space are combined in a 600-ft x 180-ft steel frame building. All maintenance is carried out by company forces. In the 10 years Creole has operated on the peninsula, an intensive effort to develop craft skills has developed manpower to the point where efficiency equals that found in the Gulf Coast area of the United States.

Creole has a number of projects definitely planned for expanding the Amuay Bay refinery. Under construction is a fourth crude unit of 104,000 b/d capacity, scheduled for completion in October 1957; also, a 17,000 b/d diesel-oil hydrofiner will be placed onstream early in 1958. This latter unit will materially lower the sulfur content of diesel oils manufactured at Amuay. A fourth finger pier is under construction, and will provide two additional berths designed for 60,000 dwt tankers. Beginning in 1958, a line of lubricating oils will be manufactured at the Amuay Bay refinery. Lube stocks will be produced by phenol extraction, propane dewaxing, and hydrofining. Blending, packaging, and warehousing facilities are to be included.

*Caripito Refinery:** Caripito, in the state of Monagas, is the site of the Creole Petroleum Corp.'s eastern Venezuelan refining

*Information contributed by Harvey S. La Seur, Creole Petroleum Corp.

VENEZUELAN REFINERIES
(Barrels Daily)

Company	Refinery	Crude Distillation Capacity	Cracking Capacity
Creole Petroleum Corp.	Amuay Bay[1]	250,000	——
	Caripito[2]	75,000	——
Cia. Shell de Venezuela	Cardon[3]	203,000	35,000
	San Lorenzo	45,000	——
Venezuela Gulf Refining Co.	Puerto La Cruz[4]	59,000	8,500
Sinclair Oil and Refining Co.	Puerto La Cruz	35,000	——
Colon Development Co.	Calvario[5]		——
	Casigua[5]		——
	La River[5]		——
	El Cubo[5]	570	——
Socony Mobil de Venezuela	Silvestre	200[5]	——
Texas Petroleum Co.	Tucupita	10,000[5]	——
Richmond Exploration Co.	Bajo Grande	10,000[6]	——
Phillips Petroleum Co.	San Roque	3,000	——
		690,770	43,500

[1] 11,100 fluid Hydroformer unit, fed by 20,500 b/d naphtha fractionator and stabilizer unit. Fourth crude unit of 104,000 b/d capacity scheduled for completion October 1957. 17,000 b/d diesel oil hydrofiner to be placed on stream early in 1958. Lube oils to be produced in 1958.

[2] Crude capacity is composed of atmospheric crude topping unit and coil-only Visbreaker with normal capacity of 60,000 b/d; additional 15,000 b/d can be processed by fluxing to visbreaker evaporator.

[3] 8,700 b/d thermal reforming unit. Processing facilities include gas separation unit and mixed C_3/C_4 polymerization plant. Lube oil manufacturing capacity of 3,000 b/d. Fluid catalytic cracker scheduled to go on stream August 1957. Includes twin high vacuum feed preparation units, gas separation unit, HF alkylation unit, second polymerization unit, soda washing units, and solutizer gasoline treater.

[4] Has 14,000 b/d Visbreaker capacity. Cracking is fluid catalytic capacity. Plant owned 2/3 Mene Grande Oil Co., 1/3 The Texas Co.

[5] Skimming plant only. [6] Asphalt and skimming plant. Combination atmosphere-vacuum distillation unit, 20,000 bbl. atmosphere crude unit planned.

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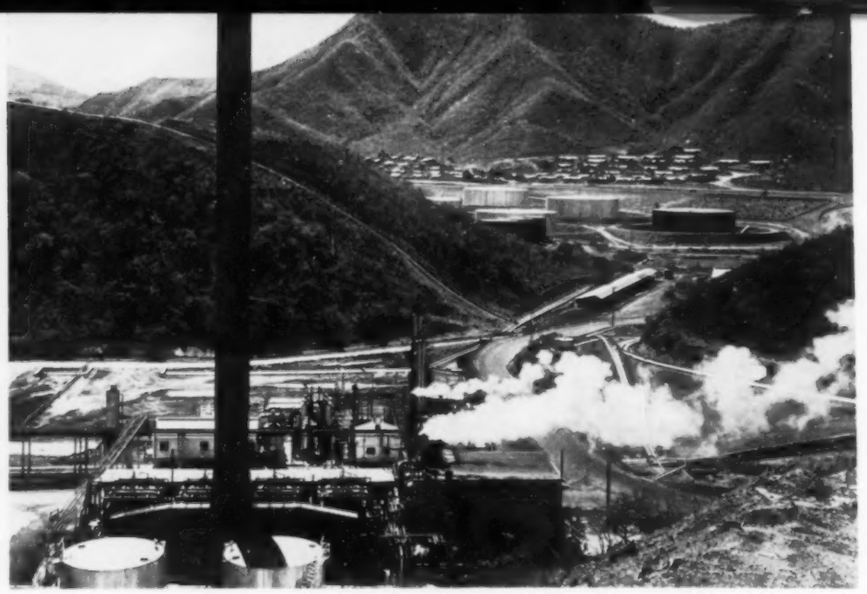

Puerto La Cruz refinery, Sinclair Oil and Refining Co.: National housing is seen in the background.

and terminaling operations. The company's Jusepin crude production reaches the refinery through 75 km of 10-in. pipeline; its Quiriquire crude production is supplied through 16 km of 16-in. to 20-in. pipeline. By making Quiriquire natural gas, supplied from a distance of 20 km through two 10-in. lines, the primary refinery and powerhouse fuel sources, Creole has a fuel-products refinery completely integrated with its producing operations.

The refinery contains an atmospheric crude topping unit and a coil-only visbreaker. The combined normal capacity of these two units is 60,000 b/d; however, a maximum of 15,000 b/d additional of heavy crude can be processed by fluxing it to the visbreaker evaporator, depending on the market requirements for fuel oil.

At normal throughputs, heat input to the topping-unit furnace averages 115 million Btu per hour and that to the visbreaker furnace 200 million Btu per hour. Originally fired with a combination of steam atomizing fuel-oil burners and burners using refinery gas, the capacity of each furnace was increased 10% to 15% by converting all steam atomizing fuel-oil burners. Refinery-gas production is used to enrich the natural gas fired, and the oil-firing system is utilized only for emergency standby purposes.

The refinery is adjacent to the company-owned camp, and is surrounded by jungle country. The camp, however, is located on high ground relative to the nearby San Juan River. Since the nearby town has inadequate facilities, about 62% of the 1,023 refining and producing employees live in company housing. Complete living, recreational, and medical accommodations are provided by the company. There are substantially built houses, a clubhouse, hospital, commissary, restaurant, golf course, and swimming pool. The golf course is considered one of the best in Venezuela. Paved highways exist between Caracas and Caripito, but travel is usually by plane. Close contact with company headquarters in Caracas is maintained using radio-telephone service.

Caripito has its own maintenance shops, warehouse, office, and laboratory. All facilities, such as heavy and light maintenance, steam and power, medical and accounting, are common for both refining and producing needs.

The Caripito terminal is located on the west bank of the San Juan River, 56 miles from the Maturin channel entrance. The draft of vessels calling at Caripito is controlled by the depth of water over the Maturin bar, which is 32 ft at mean high water. This depth is maintained by continous dragging operations under direction of the Creole Marine Department. The Maturin channel is 14 miles in length, and is marked with 34 lighted channel buoys. In addition, 40 stake lights are located in the San Juan River, Pedernales bar, and Cano Manamo. All of these navigation aids are maintained by the company.

Creole has the responsibility for controlling all ship traffic over the bar and in the San Juan River. All traffic more than 23 ft in draft is restricted to one-way passage over the bar; while all ship traffic, regardless of draft, is restricted to one-way movement between Marieta Point and Caripito, a distance of 23 miles. Traffic control is maintained through continuous radio communication between company agents in Caripito and a sub-agent, located at Guiria. Instructions necessary for safe operation are issued at Guiria. With a 12-ft range of tide in the dock area and tidal currents of 3 knots during flood and 3½ knots during ebb, tidal information is of utmost importance. All ocean tankers are turned and moored on the flood tides. Guiria also functions as the embarkation and disembarkation point for all government pilots, and the place where medical clearance is granted to ships proceeding from the exterior. In addition, at Caripito, all necessary port services, such as preparation of sailing documents, cargo documenting, and transporation to and from vessels from customs immigration, and security officials, are provided by Creole.

The bulk of finished production, and all of the crude not processed, is shipped from Caripito by tanker or barge. Approximately 320 tankers and 75 barges are loaded annually to distribute crude and products to local and worldwide markets. A product of special interest is a low-sulfur low-vanadium fuel oil, produced from Jusepin crude, for the passenger liner *SS "United States."* Caripito is the only source of supply for this product, and has the distinction of being one of the major suppliers of low-sulfur low-pour-point distillate fuel oils.

The bulk of export production is distributed in Europe and South America, making the refinery an important part of the growing economy in eastern Venezuela. The ocean tanker *"Esso Orinoco"* is anchored at Guiria as a bunkering station, receiving its supplies of bunker fuel oil, marine diesel, Esso diesel, and boiler water from Caripito for distribution to customers. The majority of ships carrying ore from the rich iron mines on the Orinoco River receive their bunkers at this "filling station," in addition to many other vessels plying the trade routes to and from the Antarctic whaling grounds, Argentina, and Brazil. A large part of the increasing demand for petroleum products in eastern Venezuela is met with Caripito products. Turbo-jet fuel is supplied to the Maturin and Barcelona airports, in addition to aviation gasoline, produced in Creole's Amuay Bay refinery. Motor gasolines of 75, 85, and 95-octane are distributed to the Venezuelan motoring public; while industrial demand for kerosine, light and heavy diesel fuels, and heavy residual fuel (SSF viscosity, 200 sec at 122 F) continues to increase. By meeting all of these local and export demands for petroleum and its products, Creole's Caripito refinery is one of the major industrial contributors to the progress of Venezuela's economic life.

Bajo Grande: Richmond Exploration Co. completed construction of its 10,000 b/d Bajo Grande refinery, June 4, 1956; and the modern installation has been producing for the export trade since June 15 of that year—mostly asphalt and No. 6 fuel oil, but small quantities of kerosine, No. 2 and No. 4 fuel oil as well. Naphtha and kerosine specifications are rigidly controlled so they may be mixed with the liquid asphalt, although the refinery has to buy some additional quantities of these, since the asphalt content of its Boscan crude is very high, yielding about 7,800 bbl per 10,000 bbl of asphalt.

The distillation unit is a modern two-stage atmospheric and vacuum unit, with the fuel oil and asphalt obtained from the latter. Crude has to be heated to 70 C to flow in the pipeline to the refinery, where it is preheated for charging. Other refinery units include a water-cooling tower, six 40,000-bbl tanks, two 30,000-bbl tanks, and some smaller ones; mixing facilities for asphalt and fuel oil; plus the docks, submarine loading line, and other terminal facilities.

There is an additional 20,000 b/d atmospheric crude unit planned. END

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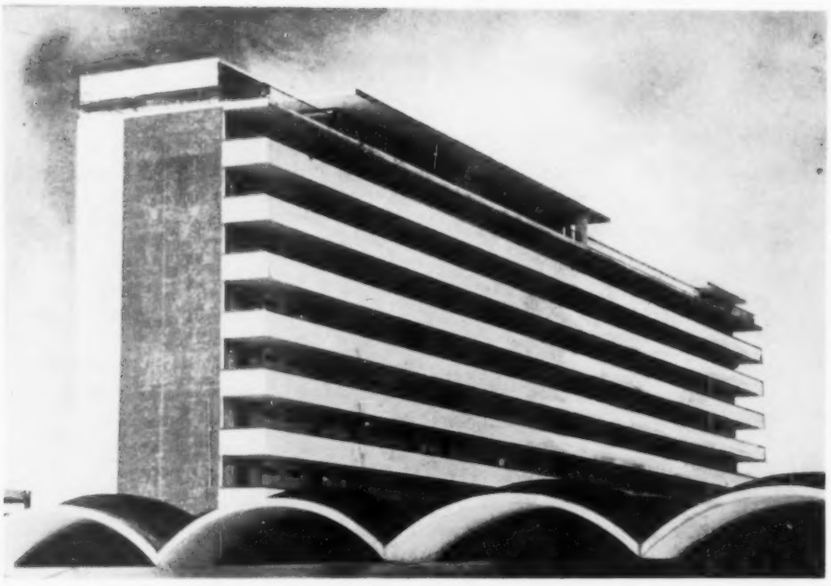


Hotel Tama

Outstanding among these is the carrying out of supervisory functions, especially those concerning the coordination of industrial and commercial development with agriculture, cattle raising, and mining—labors which require a study and knowledge of activities projected for such purpose by other national dependencies.

A country characterized by the diversification of its industry needs an office, within the Ministry of Economy—an Office of Development—to investigate all the technical and economic factors which directly or indirectly are related to the process of development. The basis of the study of such factors is their arrangement and classification so that they can be applied in the manner permitting their best use. With this in mind, the Office of Economic Planning and Investigations was created, as well as the objective of this bureau which, in general, is the knowledge and technical guidance of the different economic factors which make up the economy of Venezuela, and with which they can be evaluated in form and order. This latter serves as guide to the development of all the principal plans, and guides the development of all these factors, independently and in conjunction with one another.

In line with these expressed aims, the Office of Development has participated during its two years of activity in studies and reports on the definitive planning for reduction of electric rates in Caracas. Through this means, residential clients were granted a reduction of between 16% and 18%; and industrial tariffs were granted an overall reduction of 10% as of June 1956. Its influence on the demographic growth of the country is also evident. While taking into consideration the need for measures to encourage the desired increase in the population of the country, it also endeavors to solve the problems engendered thereby—harmonizing population growth with other aspects of national development.

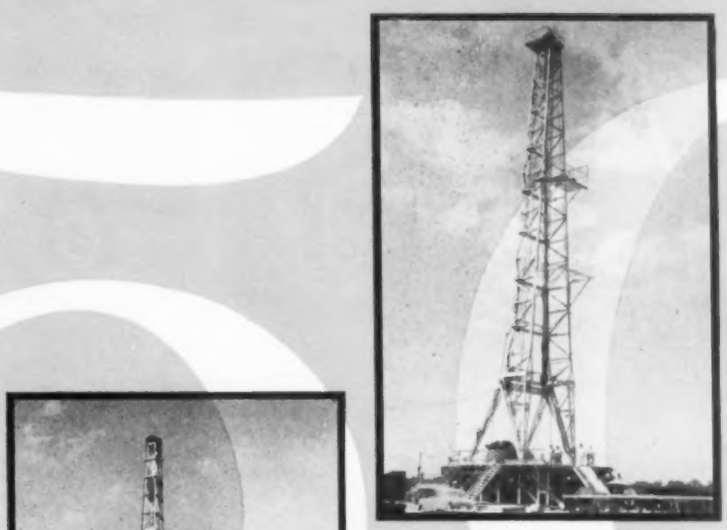
Hotel Maracay

At present Venezuela, through the Office of Economic Planning and Development, of the Ministry of Development, is carrying out studies on the economic development of the country, commercial nomenclature for exports and imports, general demographic studies, preparation of industrial manuals, studies on methods required for the evaluation of real property, and general studies of industry and national agricultural protection.

Development of Tourism: The physical contexture of Venezuela is intimately linked to its landscape. For Venezuelan and foreigner alike, the panorama evokes the desire to know, to travel, and to penetrate nature itself. Thus, the development of tourism is a vital preoccupation. Venezuela already has its tourist areas. Tourist circuits are established in both East and West, for example, which are well laid out touristically. The sea and the mountains are real incentives for making this economic activity an industry of great promise. At the same time, the Venezuelan plains ("llanos") have been incorporated into the movement. In this respect, the nation applies its natural resources and part of its revenues to convert into reality what was heretofore only a proposal. Bella Vista, in Margarita Island; Prado del Rio, in Mérida; El Tama, in San Cristobal; Aguas Calientes, in Ureña; Miranda, in Coro; Llano Alto, in Barinas; Trujillo, in Trujillo; Maracay, in the beautiful valley or Aragua; and "The Humboldt," which watches over the valley of Caracas, are concrete steps among those things which have been done in Venezuela towards creating an efficient tourist industry.

Plans are being forwarded which provide for the construction of hotels in Santo Domingo, in the state of Mérida; the Hotel Guaicamacuto on the coastline of the Federal District; and the Hotel Cumaná in the capital of the state of Sucre—with which the second stage of the National Tourism Plan will have been completed.

Venezuela, in this sense, has started at the beginning: by constructing hotels through the length and breadth of its geographic extent. Together with this, it has intensified its communications plan to make the different regions more accessible to the traveler and the tourist. With a clear sense of reality, Venezuela has dedicated itself to a task which in other countries constitutes a source of important revenue, and the best vehicle for a deeper understanding of its land and its people. END



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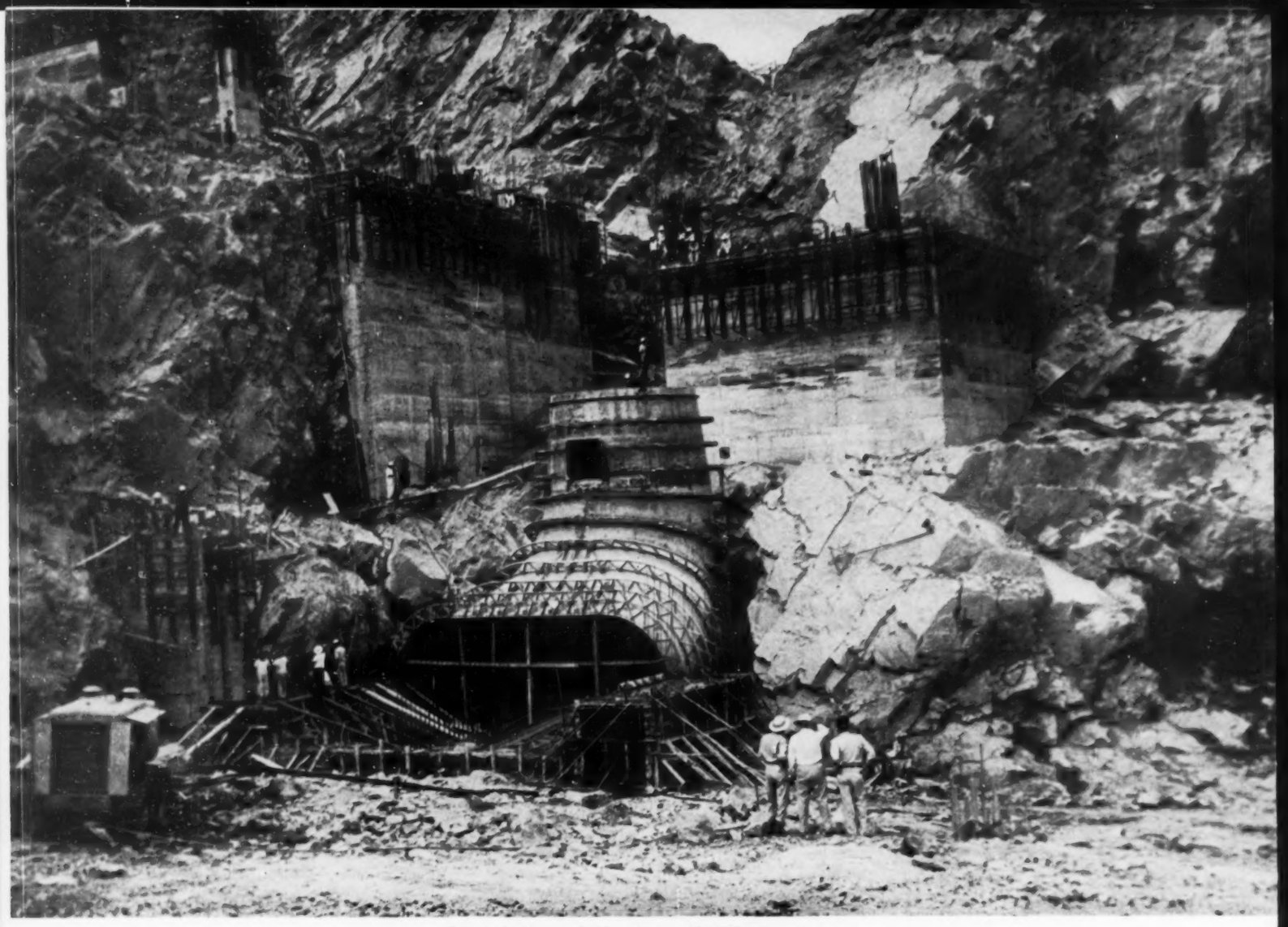

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Discharge tube at Monteje. Capacity 105 M³ per second.

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La Planificacion en el Orden Economico General—En Venezula, aun cuando la producción se encuentra directamente ligada a varias dependencias oficiales, Fomento constituye en realidad el Ministerio de Economía. De aquí que su organización, dentro de la forma más técnica-posible, constituyera en la actualidad preocupación fundamental del Despacho en conformidad con el ESTATUTO Orgánico de Ministerios.

La Dirección de Planificación e Investigaciones Económicas es la encargada de estudiar y ordenar los asuntos de carácter general que competen al-Despacho. Entre estas se destacan la realización de funciones de supervisión, especialmente aquellas referentes a la Coordinación del desenvolvimiento industrial y comercial, con la producción agrícola pecuaria y minera, labores estas que requieren el estudio y conocimiento de las actividades proyectadas con tales fines por otras dependencias nacionales.

País que se viene caracterizando por la diversificación de su industria, necesitaba de una dependencia que dentro del Ministerio de la Economía—Despacho de Fomento—se ocupara de investigar todos los factores técnicos y económicos que directa e indirectamente están relacionados con el proceso de desenvolvimiento de la misma. El estudio de dichos factores tiene como principio su ordenación y clasificación con el propósito de que sean aplicados en forma tal que permita su mejor utilización. Esta circunstancia ha determinado el fin perseguido con la creación de la Dirección de Planificación e Investigaciones Económicas, así como también la meta objetivo de esta Dependencia que en líneas generales es el conocimiento y enfoque técnicos de los diferentes factores económicos que componen el sistema de aquel país, y con lo cual se logra evaluarlos en forma y orden que posteriormente sirvan para tratar las directrices—principales que han de guiar el desarrollo de cada uno de estos factores, independientemente y en conjunto.

Consecuentes con las finalidades expresadas, en los dos años que tiene en actividad la mencionada Dirección ha intervenido en los estudios e informes sobre el planeamiento definitivo para la reducción de las tarifas de la electricidad de Caracas, por medio de la cual se logró una rebaja de aquellas pagadas por los clientes residenciales, que oscila entre 16 y 18% sobre el conjunto, y que propició otra en las tarifas industriales aplicadas con posterioridad a junio de 1956 con una representación global no menor del 10% de los ingresos—brutos producidos por venta de energía eléctrica al sector industrial. Su influencia en el crecimiento demográfico del país, también as evidente. Considerándose la necesidad de tomar medidas previas que al permitir el incremento deseado de la población del país eludiera los problemas conexos armonizando dicho crecimiento con otros aspectos del desarrollo nacional.

En la actualidad, Venezuela, a través de la Dirección de Planificación del Ministerio de Fomento realiza estudios sobre el desa-

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rrollo económico del país; nomenclatura comercial para importaciones y exportaciones; estudio general—sobre demografía racional; preparación de manuales industriales; estudios sobre metodología requerida para la avaluación de bienes inmuebles y estudio general sobre industria y sobre la producción agrícola nacionales.

De la misma manera se presta suma atención a los estudios regionales, con miras a realizar en el futuro un estudio general sobre el desarrollo económico del país, poniendo especial énfasis en el incremento de las industrias regionales y en las posibilidades y facilidades locales que cada región ofrece a tal propósito.

Fomento del Turismo.—La contextura física de Venezuela está íntimamente ligada al paisaje. Para el venezolano y el extranjero la emoción del panorama determina la voluntad de conocer, de viajar, de compenetrarse con la naturaleza misma. De aquí que el Fomento del Turismo sea una preocupación vital, fundamental. En Venezuela ya se han establecido las regiones turísticas. Los circuitos turísticos. Oriente y Occidente, por ejemplo, ya están verdaderamente estructurados turísticamente. El mar y la montaña constituyen verdaderos incentivos para hacer de esta actividad económica una industria de futuro promisor. De la misma manera, el Llano venezolano se ha incorporado al movimiento. En este sentido la Nación aplica sus recursos naturales y parte de sus ingentes proventos para hacer realidad lo que antes era apenas propósito. Bella Vista, en Margarita, Prado del Río, en Mérida, El Tamá en San Cristóbal. Aguas Calientes en Ureña, Miranda en Coro, Llano Alto en Barinas, Trujillo en Trujillo, Maracay en los hermosos valles de Aragua, y el Humbolt que vigila el valle de Caracas, son realizaciones concretas de cuanto se ha hecho en Venezuela por estructurar una eficáz industria turística.

Los Planes que se adelantan contemplan construcciones de hoteles en Santo Domingo, en el Estado Mérida; el Hotel

Hotel Miranda

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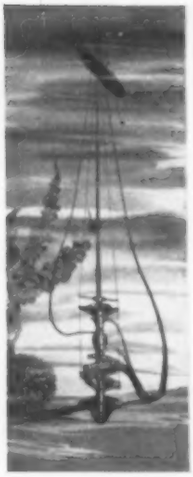
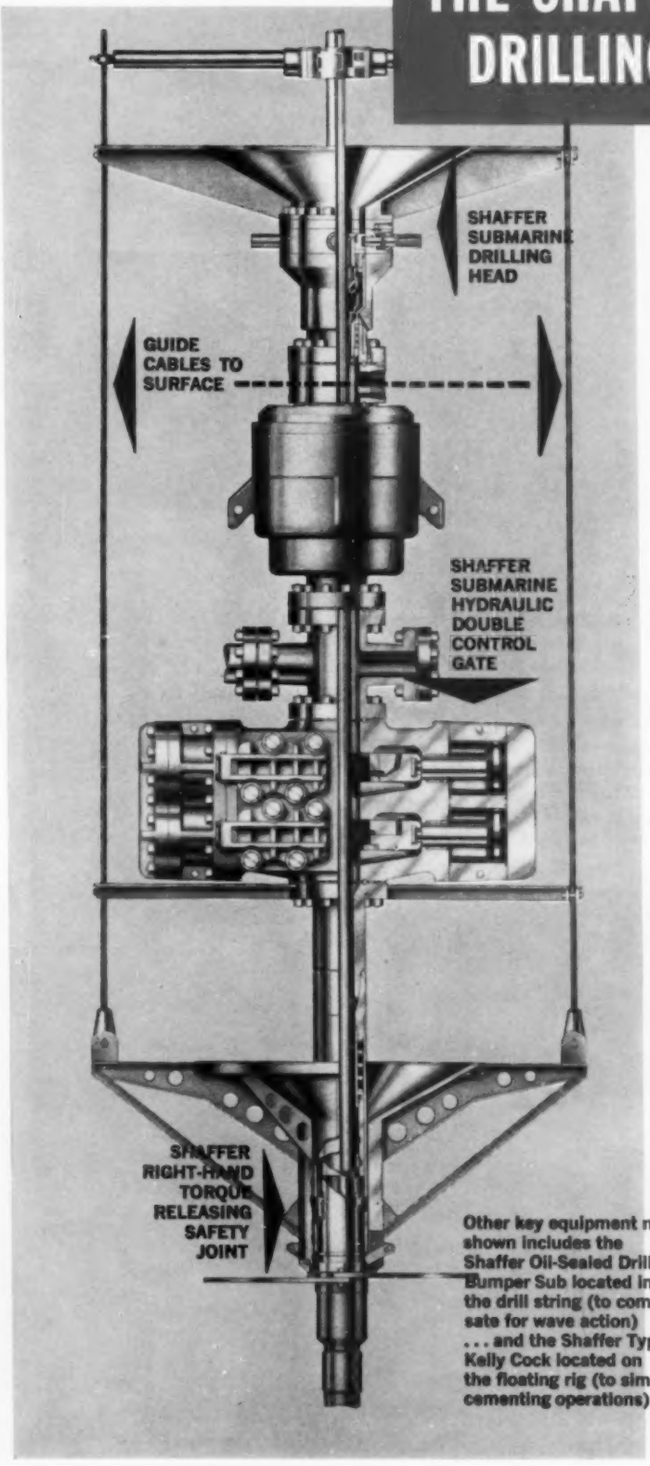


THE SHAFFER SUB-SEA DRILLING HOOK-UP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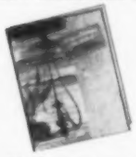

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Venezuela en este sentido ha comenzado por el principio: Por construir hoteles a todo lo largo y ancho de su dilatada geografía. Conjuntamente a ello ha intensificado su Plan de vialidad para hacer más asequible al viajero, al turista, las diversas regiones. Con un sentido claro de la realidad, se ha empeñado en esta labor que en muchos otros países constituye fuente de ingreso de suma importancia y el mejor vehículo para un mejor conocimiento de la tierra y sus hombres. FIN

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La Zalina Platform

(Continued from page 122)

omitting the roof entirely. This last possibility was very quickly discarded once the factors of contamination, vapor loss, and fire hazard had been fully evaluated.

Many types of fixed roof's were laid out —some using wooden piling as columns, others using precast concrete members. Wooden roofs, concrete roofs, steel, and combination of all these materials, were checked. All these ideas had certain flaws which preclude their use. One basic flaw common to all fixed roofs was the establishment of a large vapor space in which explosive mixtures of air and gases would collect. The use of an inert-gas generating system to nullify this was considered; but, because of various complications, this was abandoned. Eventually, because of the potential hazard, because of the economics of the various designs, and because of limitations imposed by availability of equipment and materials, it was decided that a floating roof would be more practical.

A floating roof does however, involve sons; it does not require an expensive supporting structure; it reduces vapor losses considerably; and it greatly decreases the hazard of fire or explosion.

A floating roof does, however, involve some particular problems of its own. Since it floats inside a wall, provision must be made to get the rain off the roof without contaminating the oil body. Provision for maintenance must be incorporated. Some form of seal must be constructed to tie the floating roof into the sidewalls of the reservoir. In the case of a vertical walled reservoir, this problem is not especially difficult: but, in an inclined walled reservoir (the case of Creole's earthen reservoir), it can be seen that many difficulties ensue. Of course, one possible solution would be to use a water bottom which, through the addition or subtraction of water, would keep the fluid level approximately constant. However, the additional pumping costs and other necessary details which must be incorporated in such a scheme make it unattractive.

Considering all these factors, simple floating roofs for both Creole's concrete reservoir design and for the company's earthen reservoirs were evolved—the choice of which will, of course, depend on the final selection of reservoir to be built.

Future construction on the terminal will provide additional steel tankage and reservoirs as production increases. All supplementary facilities such as pumping stations, electrical substations, pier offices, ballast-disposal pits, etc., will also be located in this terminal.

The completion of this project has provided Creole with one of the most modern and economical oil-handling terminals in the world. The first docking occurred June 1957. END

Raykin "fender buffer" showing assembly of wooden piles, steel beam, and wooden rubstrake and water. Note rubber in between steel plates.

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Legal and Fiscal Aspects

(Continued from page 101)

which take place both within and outside Venezuela[44]. Such regulations have fixed a percentage of gross income as net income for various types of enterprises. Included in this category are foreign motion-picture producers, international news agencies, insurance companies not domiciled in Venezuela, foreign companies sending goods to Venezuela on consignment, and international shipping companies. Net income of the last-named is fixed at 10% of gross income, which is defined as one-half the freight and passenger revenues from voyages between Venezuela and foreign ports and return plus all income from operations in Venezuela or Venezuelan waters[45].

Deductions are permitted only for expenses incurred in Venezuela[46]. Within this limitation, the cost of doing business is deductible[47]. Such costs include writeoff of bad debts[48] and operational losses. The latter may be carried forward two years[49]. Depreciation of fixed assets may also be deducted from income according to ordinary accounting principles[50]. The costs of finding oil must be capitalized and depreciated on a unit-of-production basis. Such costs may be divided into the following groups: 1, purchase price of production concessions or amount of initial production tax and any exploration costs incurred in obtaining the concessions; 2, direct expense of exploration, including costs of access roads, exploratory wells, camp installations, and surveys; 3, cost of installations of a permanent nature, such as wells, including development costs and intangible drilling expense; and, 4, a reasonable portion of the indirect expenses incurred in the above, such as welfare and camp costs, supervision and other overhead. Depreciation units for concession costs are those covering a proved field and for wells, a well, group of wells in a field, or a concession. Dry holes may be capitalized or expensed; but once a method is selected, it cannot be changed without consent of the tax administration. The same is true of depreciation methods, rates, and units[51].

Taxable income for surtax purposes is substantially that used for the basic tax, except that the loss carryover is not allowed[52]. Rates commence at 1 1/2% for the first bs. 10,000, and progress to 26% on amounts in excess of 28 million *bolivares*. If taxable income exceeds 14 million *bolivares*, a reduction of from two to four percentage points in the tax rate is allowed on half the excess to the extent that such half is equalled by capital investments within Venezuela to develop or expand the business of the taxpayer. Not included in this figure are investments made to comply with labor or sanitation laws[53].

All taxable income of a company engaged in an extractive industry is also subject to an additional tax to insure that the nation receives at least 50% of the net income from such enterprises. This provision was first applied in 1948, and was the precursor of the so-called 50-50 principle in other oil-producing areas in the world. Commencing with the taxable income for basic tax purposes, certain tax-free income—such as dividends from companies not subject to the additional tax—is added. From this are deducted normal and necessary expenses related to operations in Venezuela but not deductible for basic tax purposes (as where incurred outside of Venezuela), but income taxes paid to foreign countries may not be deducted. Also deductible are additions to reserves for future normal and necessary expenses. From this are subtracted all taxes *(impuestos)* paid to the Venezuelan nation, even though capitalized—such as basic and surtax, production tax, surface tax, customs duties, gross-receipts tax, sealed paper, manifest tax, but not fees *(tasas)* or taxes habitually passed on to customers such as the consumption tax—except the exploration tax and the initial production tax[54]. The additional tax is 50% of the balance, if any. In practice, the nation may receive more than 50% of net income[55].

Taxpayers whose net income after basic and surtax does not exceed 10% of net assets invested in the petroleum business in Venezuela, or outside Venezuela if related to Venezuelan operations, are exempt from the additional tax. If such net income is between 10% and 15% of net assets, the additional tax is assessed only against half of the balance remaining after the computation described in the last paragraph has been made[56].

If two or more companies are "controlled by the same interests" and one is subject to the additional tax, all will be subject thereto and their returns consolidated even though some would not otherwise pay the additional tax (as, for instance, pipeline, shipping, marketing, or refining companies). However, the Executive is authorized to, and sometimes does, grant exemption from such consolidation[57]. What constitutes "controlled by the same interests" is not specified, but is generally considered to mean a 50% voting stock interest.

The statute of limitations under the income-tax law is five years from the day the return was to be made; or, in the case of penalties or actions for recovery of overpayment, from the date of the penalty or overpayment[58].

In keeping with recent moves to improve governmental administration by centralizing governmental functions in the national government, the various state sealed-paper laws were repealed in 1955 by a new law which also introduced other modifications[59]. The present law governs documentary stamps and sealed paper (which must be used, among other things, for documents which may have to be used as proof in courts and many communications to or from the government) and also provides for a 5-mil gross-receipts tax[60]. The latter is what its name implies; but, since no regulations have yet been issued, various areas of its application are not too clear.

Customs duties are an important source of governmental revenue (20% in recent years), and the Venezuelan Customs Law[61] imposes duties on most imports. Nevertheless, the Hydrocarbons Law authorizes the Executive to grant complete or partial "exoneration" of import duties on materials and equipment which it is necessary to bring into the country for one of the activities for which a concession has been granted. This has been done through contracts with the various companies. "Exonerated" material must be carefully guarded; and, if it is sold, given away, stolen, or used for any purpose other than that for which imported without payment of duties, the duties must be paid. As a result, many oil companies do not take full advantage of exoneration authorized. Also the amounts involved may not justify the expense of record keeping required by the law, or the time necessary to obtain exoneration may be a factor[62]. Moveover, many installations are being tied into open communities. This necessitates duty payment, and in some cases permission from the Executive, if such installations were built with "exonerated" materials.

Operations: Here will be considered the various rules imposed upon oil operators as well as the permits required from the government or private persons in order to carry out their activities. These will be described in the following categories: relations with owners or occupants of land; permits necessary for exploration and construction of various types of installations; drilling and production rules; and labor-law requirements.

There are several methods of dealing with owners or occupants of land: written permits; easements *(servidumbres)*; purchase or lease. There are also several types of owners: the nation (such lands are called *Baldíos*); municipalities (such lands are called *ejidos*); private individuals; and groups of co-owners *(communidades)*. Easements over *baldíos* lands are granted by the Ministry as a matter of course to a concessionaire whose concessions cover, or whose operations necessitate, the use of such lands[63]. These easements give the concessionaire the right to use the land for any operations related to his concession. Occupants are entitled to receive payment for damages to crops and other improvements made by them unless they have entered against the express refusal of the owner[64]. Exploration agreements with such persons, as well as with landowners, are frequently in the form of permits containing a schedule of damage payments per tree, fence, cut, shothole, etc.

If the lands are not *baldíos*, it is customary to negotiate an easement to use the lands for drilling and production activities, although some lands are purchased. The usual easement agreement currently in force provides for yearly rental payments over the whole of the landowner's property for a right of entry—including surface exploration—with a right in the grantee to select blocks—frequently of 500 hectares (1,235.5 acres)—out of the entire area, as to which the easement will cover all drilling

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and producing activities and over which the yearly rentals are substantially higher. Such agreements are usually terminable at the will of the lessee, but frequently rentals are paid several years in advance. In addition to the rental payments, the owner is compensated for damage to his property. Leases are sometimes used where easements cannot be obtained. Purchase is not generally resorted to unless the land is needed for permanent installations such as camps, terminals, etc., or unless it is desired to drill near a dwelling[65]. Such permanent installations have also been constructed pursuant to easement agreements.

As will be readily apparent, the life of a landman in Venezuela is not without its problems. Many landowners have exaggerated ideas of the value of their property when needed by oil companies. Much property is held in some form of tenancy in common through inheritance or otherwise —which means dealing with multiple owners. Entering the property lacking the consent of the holder of a small interest can lead to litigation. In many areas boundaries are tied to trees or other landmarks which no longer exist. Most old surveys are incorrect. Frequently the description is in ambiguous terms, and the owner claims title to more area than he owns. For instance, a Spanish league is only 1,747.24 hectares (4,317.4 acres); whereas a Venezuelan league is 2,500 hectares (6,177 5 acres). Although early descriptions using this term undoubtedly referred to the former, it is to the landowner's advantage to claim that the Venezuelan league was intended.

Where the concessionaire cannot reach an agreement with the landowner or occupant because of the price demanded or other reason, he has several possible legal remedies. For surface exploration or other temporary purpose (including seismic work) he may, pursuant to the provisions of the Expropriation Law[66], request an order permitting same from the governor of the state in which the property lies. Such order for occupancy may not exceed six months, and can be renewed only once. Damages to the landowners' property must be paid for. When the exploratory work for which the temporary occupancy is required will be on land not covered by a concession in favor of the person proposing to do the exploration, the Ministry must authorize resort to such procedure[67].

For operations of a more permanent nature, the property may be expropriated or a type of judicial easement may be sought, since the oil industry in Venezuela is declared to be a public utility. If there is no opposition, a petition for expropriation will normally be granted upon a mere showing of need after a hearing upon published notice. Opposition may be based on violation of the law, or expropriation of the entire property may be required when taking a part will make the balance unusable. After the decree of expropriation, if the parties cannot agree on a price, an appraisal will be made by one of three appraisers named by the parties or, in the case of disagreement, by the court[68].

A judicial easement is provided in the Hydrocarbons Law in the event the owner of land refuses to give an easement. The same procedure is followed with respect to occupants, although here the value of the award will take into account only physical damage. This remedy purports to give a concessionaire the right of immediate occupancy after determination and deposit in a bank of probable damages. The appraisal is conducted by experts appointed by the parties. The court may appoint the landowner's expert if the latter refuses or the representative fails to attend the proceedings[69].

Permits required from governmental agencies are many and varied. Some of these are described below. A permit from the Agriculture Ministry is required before trees are cut, whether the trees are on government or private lands and whether or not on lands covered by concessions[70]. Permits from the Defense Ministry are necessary to import, store, or use explosives[71]. For seismic velocity or other surveys in water using explosives, permission from the Agriculture Ministry is necessary[72]. Whenever a permanent intallation of any kind connected with transportation or refining of petroleum or gas plants is contemplated, a petition to construct, accompanied by plans and description of the project, must be submitted to the Ministry of Mines for approval[73]. When the work is completed, the Ministry must be notified of such completion and its approval secured prior to start-up[74]. If the installation is to be built on or over water, or if work is to be done over water, approval of the Communications Ministry must be obtained[75]. If the installations will contain quarters or sanitary facilities for persons using them, a permit must be procured from the Labor Ministry, the Sanitation Ministry, or local sanitary inspector; and, in some cases, the municipal engineer[76]. Construction of schools must be approved by the Education Ministry[77].

The drilling of wells—except for exploratory wells not more than 100 meters (328 ft) deep which may be drilled outside the concessionaire's concession boundaries—and production activities in general are governed by a number of rules the nature of which will not seem unusual to anyone familiar with similar activities elsewhere in the world. However, not only are production concessions seldom less than 500 hectares (1,235.5 acres) in area, so that the problems of drilling and producing town lots and other small leases are not present in Venezuela, but concessions are usually granted in much larger contiguous areas to one concessionaire—thus allowing development under optimum reservoir practices in order to return the maximum economic benefit to both the nation and the concessionaire. There is a Technical Office of Hydrocarbons in the Ministry which is charged with overseeing all matters involving hydrocarbons[78]. As part of this office, there are several technical inspectors' offices (at present there are three, viz., at Maracaibo, Maturín, and Barcelona). Under the technical inspectors, there are field inspectors who are the officials who have day-to-day contact with operations. It is the latter who approve drilling locations and other operations, subject to review by their superiors. Field inspectors also supervise the gauging of production for production-tax purposes[79]. There is a conservation group in the Technical Office of Hydrocarbons which also has field personnel; but they report directly to Caracas, not to the technical inspectors.

The provisions of the Hydrocarbons Law, upon which the regulations and various required practices are based, are quite general. A concessionaire must take "all necessary measures . . . to protect water horizons . . . encountered during drilling . . ." and "measures technically advisable . . . to avoid damage . . . that might result to the oilfield and be prejudicial . . . to the Nation or . . . third parties" and "exercise due care . . . to avoid any loss of the substance produced and to execute operatons in such manner as to avoid waste of those substances . . .[80]"

Wells may not be drilled within: 15 meters (49.2 ft) from pipelines, 30 meters (98.4 ft) from concession boundaries, 50 meters (164 ft) from other installations—[100 meters (328 ft) in the case of wildcats], 60 (196.8 ft) meters from other wells to produce from the same horizon, and 100 meters (328 ft) from dwellings [200 meters (656 ft) in the case of wildcats], without special approval[81].

In any case, notice of intention to drill must be given to the field inspector who will, within five days, approve or disapprove the location[82]. In the latter case, the concessionaire may appeal to the Ministry. Similar notice and approval is required with respect to deepening, shooting, workovers, commencement of gas lift, dual completions, abandonment and plugging, etc.[83].

The law and regulations appear to give some latitude to the various inspectors with respect to drilling and production practices. However, the Ministry and the industry agree that these should be sound from a modern technical and conservation standpoint. As a consequence, wide spacing patterns, reasonable gas-oil ratios, gas conservation, and other modern practices are favored[84].

Various reports are required by law, regulation, and practice. The underlying provision of the law states that concessionaires must "supply to the National Executive all the data which he requires for the complete knowledge of the development of the petroleum industry in the country, as well as ample geological and geophysical information about the regions studied, be they within or outside his concessions and whatever may be the exploration method employed, as well as about wells drilled. . ." This information must be furnished within a reasonable time, not to exceed one year, after completion of the work[85]. Yearly reports must be made on the preceding year's

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operations—including concessions held, acquired, transferred, or renounced; drilling, refining, transportation taxes paid and owed; and the number, wages, nationality, nature of work, living conditions, and medical and educational assistance relating to employees[86]. An annual report must also be made of plans for the coming year, such as wells to be drilled, estimated production, and proposed construction of installations—including those for workers[87]. Complete drilling and abandonment records must be kept and sent to the field inspectors[88].

Space permits only a brief mention of some of the more important aspects of Venezuela's broad social legislation. The Labor Law[89] establishes maximum working hours[90], overtime pay[91], night bonus[92], weekly rest day[93], holidays[94], vacations[95], indemnities in case of industrial illness or accident[96], safety and hygienic conditions in work areas[97], etc. No worker may be discharged after one year of service (except on proof based on itemization of cause) without a month's notice (or pay in lieu thereof) and payment of 30 days' wages for each year of service[98]. A year-end profit sharing *(utilidades)* is required of each employer to the extent of 10% of his profits, with a maximum payment of 16 2/3% of the worker's pay for the year[99]. Through collective contract negotiations, the oil companies have granted economic benefits and working conditions more liberal than those provided in the Labor Law. Contractors who perform services for the oil companies must provide the same benefits and working conditions for their workers as the oil companies are required to give by law or collective contract if such services are connected with or inherent in the production, refining, or transportation of petroleum[100].

Under normal circumstances 75% of the employees of a company operating in Venezuela must be Venezuelan citizens. However, the law recognizes that it may be desirable to relax this requirement under certain circumstances as, for instance, where there are insufficient Venezuelan technicians available[101]. The Labor Law includes special obligations for the petroleum industry, such as construction of housing for workers in permanent camps, provision of primary schooling for workers' children, and complete medical care—including hospitalization for permanent camp workers[102]. However, there is at present great interest in government and industry circles for the establishment of open communities and dispensing with these paternalistic benefits.

Marketing: As has already been mentioned, from a legal standpoint, marketing operations in Venezuela are not a part of the petroleum industry. Nevertheless, they are sure to attract attention as more companies comply with the obligation on oil refining imposed in various concession titles, and as other consuming countries of the world increase refining capacities and reduce products imports. Local demand for products has increased, on the average, 14% per year since the war, and motor-vehicle registrations have increased 40,000 a year for the past year or two.

Despite this substantial increase, local marketing has not been very attractive because maximum prices for regular gasoline, white gasoline, and kerosine were fixed by the government in 1945 and have not been changed since[103]. Regular gasoline, for instance, is sold to the public at bs. 0.10 per liter, and in some areas at bs. 0.08 per liter ($0.12 and $0.096 per gallon). As a result, complete local marketing has been carried on only by the two largest oil companies.

Premium gasoline was introduced in Venezuela in 1951 at realistic prices, and in 1956 an intermediate grade was put on the market at a price between the premium and price-controlled grades. The number of service stations has increased greatly during the past few years, and several companies have surveyed the local gasoline market. One new company has been selling three grades of gasoline in eastern Venezuela since April of this year.

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5. *Ibid.*, Article 7, Second Special Paragraph. 6. *Ibid.*, Article 3. 7. *Ibid.*, Article 5. 8. *Ibid.*, Article 7-1. 9. *Ibid.*, Article 17. 10. *Ibid.*, Article 18. 11. *Ibid.*, Article 19. 12. *Ibid.*, Article 7-2. 13. *Ibid.*, Article 24. 14. *Ibid.*, Article 20. 15. *Ibid.*, Articles 26 and 57. 16. *Ibid.*, Article 80. 17. *Ibid.*, Article 81. 18. *Ibid.*, Articles 29 and 34. 19. *Ibid.*, Article 37. 20. *Ibid.*, Articles 63 and 64. 21. *Ibid.*, Article 65.

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79. *Ibid.*, Articles 104-106. 80. Hydrocarbons Law, Article 59-3, 4 and 5. 81. Hydrocarbons Regulations, Article 109. 82. *Ibid.*, Articles 110 and 113. 83. *Ibid.*, Articles 111, 114, and 116. 84. See *Ibid.*, Articles 121 and 122. 85. Hydrocarbons Law, Article 60. 86. *Ibid.*, Article 61. 87. Hydrocarbons Regulations, Article 107. 88. *Ibid.*, Articles 115 and 123. 89. *Ley de Trabajo* of November 3, 1947, published in *Official Gazette*, Extraordinary No. 200, November 3, 1947. See also Regulations of November 30, 1938, published in *Official Gazette*, Extraordinary, February 1, 1939. 90. Labor Law, Article 54. 91. *Ibid.*, Article 72. 92. *Ibid.*, Articles 57 and 72. 93. *Ibid.*, Article 73. 94 *Ibid.*, Article 49. 95. *Ibid.*, Article 53. 96. *Ibid.*, Articles 134-159. 97. *Ibid.*, Articles 116-123. 98. *Ibid.*, Articles 28, 31, 33, 37, and 39. 99. *Ibid.*, Articles 76-78. 100. *Ibid.*, Article 3. 101. *Ibid.*, Article 18. 102. *Ibid.*, Article 124.

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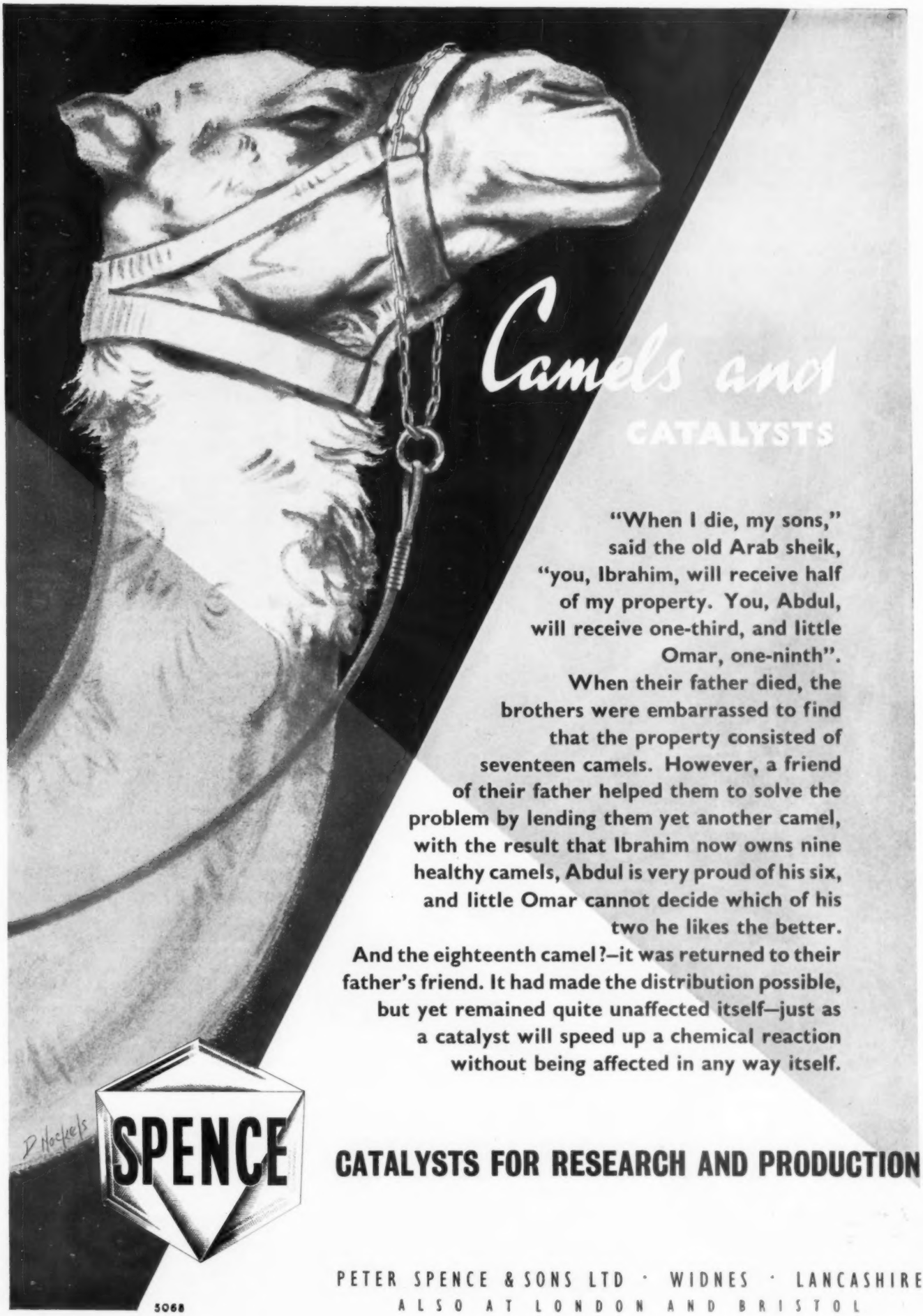
Camels and
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"When I die, my sons," said the old Arab sheik, "you, Ibrahim, will receive half of my property. You, Abdul, will receive one-third, and little Omar, one-ninth".
When their father died, the brothers were embarrassed to find that the property consisted of seventeen camels. However, a friend of their father helped them to solve the problem by lending them yet another camel, with the result that Ibrahim now owns nine healthy camels, Abdul is very proud of his six, and little Omar cannot decide which of his two he likes the better.
And the eighteenth camel?—it was returned to their father's friend. It had made the distribution possible, but yet remained quite unaffected itself—just as a catalyst will speed up a chemical reaction without being affected in any way itself.
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Opens New Orleans Office

A sales engineering office has been opened in New Orleans by the Southwestern Division of Graver Tank & Manufacturing Co. Inc., headquartered at Houston, Texas. L. H. Gilmore, formerly of Graver's Chicago sales staff, will be in charge of the new office at 1202 Richards Building, New Orleans 12.

In addition to the Houston and New Orleans offices, Graver's Southwestern Division also maintains a sales engineering office in Tulsa. The Southwestern Division is one of Graver's five fabricating centers across the nation. Graver's home office is in East Chicago, Ind.

Bad-Debt Losses 11¢ in the Dollar

Bad-debt losses of wholesale oil-well supply houses average 11 cents of each $100 of sales. This compares with 14 cents for all merchant wholesalers. The figures come from the 1954 census of business. The report shows 1,208 wholesalers in the oil-well supply field with total sales of $914,479,000. Of these, 1,035 did business on credit, and their sales were $813,241,000. The credit sales were 98.4% of these sales. Bad-debt losses were $894,565.

Oil-well supply wholesalers include firms primarily engaged in selling machinery, equipment, and tools for use in oil- and gas-field operations and crude petroleum refining. Firms owned and operated by manufacturers are included.

Otis Changes Name

After 20 years, Otis Pressure Control, oil-tool manufacturers, as of June 30 changed its corporate name and service company to Otis Engineering Corp.

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Sam C. Welker

Security Engineering in Venezuela

Sam C. Welker has been named manager of the new South American headquarters in Caracas, Venezuela, of Security Engineering Division. He was formerly rotary sales supervisor for National Supply Co., in Caracas, Venezuela, and has had extensive experience with drilling operations—both here and abroad—as foreign division engineer for Halliburton Oil Well Cementing Co. and the Brown Drilling Co., Long Beach, Calif. He has seen service in many countries—including Australia, where he was on the Western Australian Pty. Ltd. strike which aroused great hopes during 1954. Security, one of the Dresser industries, operates in many countries and manufactures a complete line of rock bits and drilling tools for the petroleum industry.

W. T. STEVENSON PASSES

W. T. Stevenson suffered a fatal heart attack at his home at Owensboro, Ky., on May 22, 1957. He had been president of Texas Gas Transmission Corp., chairman of its wholly owned production subsidiary, Texas Gas Exploration Corp.; president of Western Kentucky Gas Co., and president of its wholly owned LPGas subsidiary, Kengas, Inc. Mr. Stevenson was long recognized as a leading member of the nation's natural-gas industry. At the time of his death he was serving as a vice president and member of the board of the Independent Natural Gas Assn. of America, and had been a director of the American Gas Assn.

New LeTourneau Agency

Appointment of a new advertising agency has been announced by R. G. LeTourneau Inc., of Longview, Texas. Louis A. Flora, advertising manager, named D'Arcy Advertising Co. to handle the advertising and promotion programs for all six of the LeTourneau sales divisions.

Trans Tex-Rimrock Tidelands Merge

Trans-Tex Drilling Co. in Shreveport, and Rimrock Tidelands Inc., New Orleans, have merged. Husky Oil Co., of which Trans-Tex is a wholly owned subsidiary, will have a substantial interest in the merged company. The surviving company will be Rimrock Tidelands Inc. Executive headquarters will be in Shreveport, and exploration and drilling offices will be in New Orleans. The new organization will engage in exploration, production, and inshore and offshore drilling activities, but will specialize particularly in water operations.

Wins Safety Award

Western Geophysical Co. of America, Los Angeles, has been awarded the National Safety Council Award of Honor. Joseph Kaplan, manager of the greater Los Angeles Chapter of the National Safety Council, presented the plaque to Western's President Henry Salvatori. Western had earned the award, Mr. Kaplan explained, because of a total of 2,209,000 man-hours worked in 1956; only 165 man-hours were lost due to accidents on the job.

DESTINATION : VENEZUELA

Gradiation Heaters (above) are performing critical refinery heating operations, including Unifining . . . and Econotherm Heaters (left) are employed in heating crude oil in Venezuela. The compact design and sturdy construction of these shop-assembled heaters make it practical to transport them to the job-site, by ship and truck, ready to go into operation in a matter of hours.

Selas Gradiation® and the new Econotherm* Heaters . . . perform critical and non-critical operations in Venezuela

Venezuela is the world's largest exporter of crude and Selas is proud to have contributed to the growth of this progressive nation's great petroleum industry.

- In non-critical operations, where heating is to be accomplished below decomposition temperatures, where low first cost is an important consideration, Selas Econotherm Heaters serve producers.
- In critical processing, where preciseness in heating is required, where a variety of feed stocks must be handled, where instant response to controller demand and Zone Control are essential, Selas Gradiation Heaters serve the petroleum, petrochemical and chemical industries.

Each heater—Econotherm or Gradiation—is designed and built to do its specific job. Each heater may be shop-assembled or field erected, as conditions dictate. Both are Selas Heaters, bringing to all processes Selas knowledge, skill, experience and service.

Write Dept. 167 for bulletin "Gradiation Heating for Petroleum and Chemical Processing."

Gradiation Tube Heaters are built under one or more of the following patents: 2,527,410; 2,606,536; 2,638,879; 2,671,507; 2,716,968. *Trade Name

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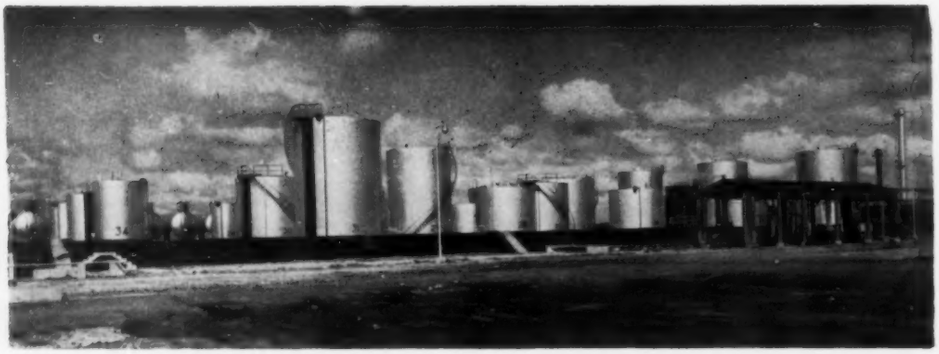
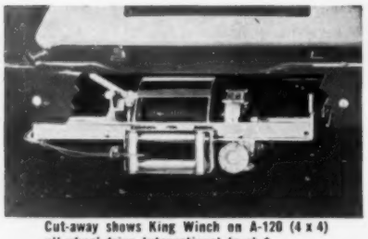
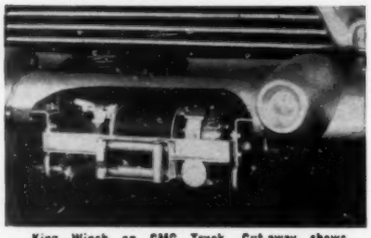


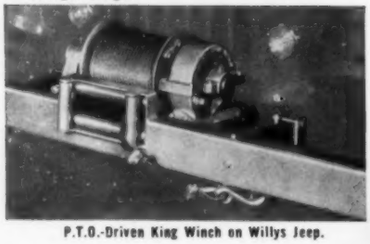
General view of Horton cylindrical, cone roof, umbrella and pontoon roof tanks for storage purposes at the Phillips Oil Company Refinery at San Roque, Venezuela. Erected by Chicago Bridge & Iron Company Ltd. with headquarters in Caracas.



Cut-away shows King Winch on A-120 (4 x 4) all-wheel-drive International truck.*



King Winch on GMC Truck. Cut-away shows underslung mounting, featuring new hi-tensile strength design.



P.T.O.-Driven King Winch on Willys Jeep.

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. . . for Willys Jeeps, 4 x 4 trucks and station wagons, International, GMC, Chevrolet, Ford, Land Rover and other vehicles.

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- bronze-bushed, 4-way cable guide rollers
- cable drum guard
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King Winches keep you moving through the most difficult terrain . . . you get action where there's no traction with dependable pulling power. King power winches have pulling capacities of 8,000 to 19,000 lbs.

*King Winches for International Harvester trucks are available through International distributors and dealers.

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FULL AND HALF CABS

Full Cab and Model 151J King Winch illustrated.

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Kilgore Appointed to NPC

Grover Kilgore, of Halliburton Oil Well Cementing Co., Duncan, Okla., vice president for sales and advertising, has been appointed to the National Petroleum Council, which advises the government on matters pertaining to oil production, refining, and distribution. Secretary of the Interior Seaton stated that Mr. Kilgore would represent the Petroleum Equipment Suppliers Assn., of which Mr. Kilgore is national president.

New Chief Engineer for Security

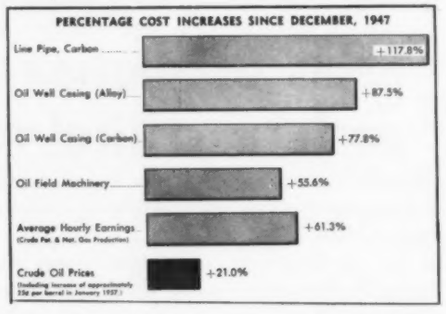
M. L. Talbert has been named chief engineer for Security Engineering Division, one of the Dresser Industries. He replaces Carl Lichte, who was recently appointed to the staff of the Turbodrill Division of Dresser Industries Inc. In his new capacity, Mr. Talbert will coordinate field and plant engineering activities for the Dallas, Texas, producer of rock bits and drilling tools.

Oil Forms Rapidly, Says Kidwell

Geologists have long been bothered by the question, "Does it take a long time to form crude oil or not?" And by a long time, geologists are thinking in terms of millions of years. Dr. Albert L. Kidwell, Carter Oil Co., Tulsa, has an answer to this problem: Oil can form quite early in the history of an area; and, by geologic standards, oil can form fairly rapidly. He has proved that some recent sediments (less than 5,000 years old) contain measurable amounts of crude oil or hydrocarbons.

Dr. Kidwell's work shows conclusively that oil pools can start to form long before the sediments harden into rocks. Field work for the study required three months in Venezuela collecting rock samples.

Crude-Oil Prices vs. Production Costs



The above chart, based on government statistics, shows crude-oil prices have lagged far behind rising production costs. Since December 1947, crude-oil prices have risen only 21%. Yet the major elements of production costs have increased an average of 80% in the same period. Percentagewise, the oil producer's costs have increased almost four times as much as the income he gets from his crude-oil sales. (Prepared by the Independent Petroleum Association of America from U. S. Bureau of Labor Statistics data.)

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Left (behind small tug): combination electrical well services and permanent well completion barge. Center: tug Commodore. Right: cementing barge. New Halliburton service vessels arriving at port of Maracaibo.

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Halliburton Adds To Maracaibo Fleet

A fleet of fifteen oil well servicing vessels is now being operated on Lake Maracaibo by Cia. Halliburton de Cementacion y Fomento, a subsidiary of Halliburton Oil Well Cementing Co. Four more vessels have been ordered which will increase the Halliburton fleet at Maracaibo to 19.

Units in service on the lake until recently included one 45-ft tug, three 55-foot tugs, one 2,500-sack self-propelled cementing barge, three cementing barges with 7,200 sack capacity, one 30,000-sack supply barge, one 38-foot twin screw boat and one fracturing barge.

Four new vessels delivered in May include a combination permanent completion and electrical well services barge, a 7,200-sack cementing barge, one 55-foot tug and one 35-foot crew boat. In addition contracts have been let for four more vessels: a 7,200-sack cementing barge, a fracturing barge and two 55-foot tugs. The barges are not to be self propelled. The Halliburton "navy" on Lake Maracaibo will number 19 vessels when the new craft are delivered.

The steel barge Halliburton 805 which is one of the four vessels recently delivered is a combination permanent well completion barge and an electric well services barge. She is 130′ x 30′ x 7′-6″ and was constructed by Equitable Equipment Co., Inc. of New Orleans. She is equipped with the latest electrical well services and permanent well completion equipment. Also she is fitted with a steel deck house arranged with quarters for four persons, galley, toilet, shower and lavatory and a large work space.

Principal machinery located below deck is a General Motors diesel generator. On deck there is a Halliburton T-10 skid cementing unit, the EWS skid unit and a two-reel wire line unit.

Special mooring arrangements were constructed and installed to meet well conditions on Lake Maracaibo. There are four modified Wilson Manufacturing Co. senior winches, the drum of each holding 1,000 ft of 1″ 6 x 19 mooring wire rope. To each mooring line is attached a special design "anchor."

The barge Halliburton 806 is a 7,200-sack bulk cementing steel barge, 122′ x 32′ x 8′-8″ built by Higgins, Inc. of New Orleans. This barge is fitted with twelve steel silos each having a capacity of 750 cubic ft. Each silo is connected to a pneumatic system of Halliburton design to discharge the bulk cement from the storage silos to a surge tank forward. This barge is equipped with a weigh silo on a 30,000-pound Fairbanks-Morse platform scale for weighing cement and additives. This silo also acts as a pneumatic blender. Two small gel silos are vested between the cement silos.

Halliburton pumping equipment is forward. This consists of three Halliburton T-10 skid pump units and a 40-barrel measuring tank. Below deck the machinery consists of a Caterpillar D318 diesel generator, two Worthington 15C-1 air compressors and a Worthington 2T-2 air compressor.

Aft there is a deck house containing quarters with toilet, lavatory, shower and bunks for two men and a galley with butane range and refrigerator.

The 55-foot tug Halliburton 906 is a Standard Equity 55-foot tug built by Equitable Equipment Co., Inc. of New Orleans. She is a twin screw tug fitted with two General Motors 6-110 marine engines and two shafts. Quarters are installed for six men.

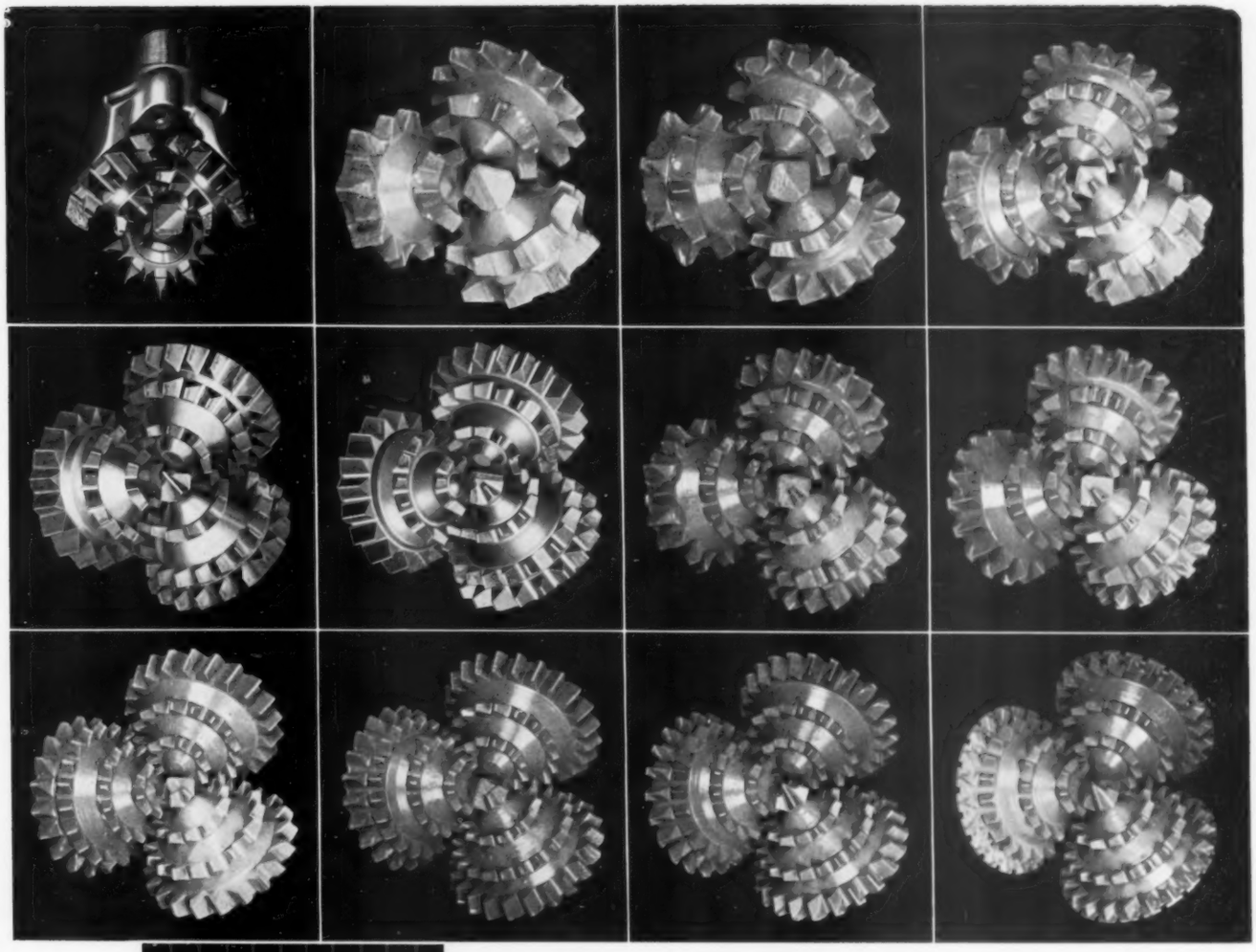
All the foregoing equipment was built under Class American Bureau of Shipping for Lake Maracaibo service.

Utah 31st Oil Compact State

Governor George Dewey Clyde, of Utah, officially signed the "Interstate Compact to Conserve Oil and Gas," May 28, 1957. This officially makes Utah the 27th member of the IOCC, along with four associate members, for a total of 31 states pledged to conserve their oil and gas resources.

New Air Line in Argentina

Aero Transportes Litoral Argentino of Rosario, South America, has begun as a new Argentina airline. Commander Gabriel A. Bó (Argentina Air Force Ret.), managing director and one of the founders of the airline, announced that the airline, using Aero commander executive aircraft exclusively, will operate from Rosario, its main headquarters, to eight major industrial and resort locations throughout the country.



Record Breakers every one of them!

Every one of these bits have played an important part in Security's rapid climb from 5th to 2nd place in rock bit sales. And each one of them has been setting a record of its own in footage drilled per bit and rate of penetration.

For example, Security S3J bits (upper left corner) were used recently to drill the fastest-drilled medium depth vertical hole in the Seria field of Borneo. Five Security bits were used to drill from 1505′ to 5556′, *an average of 810′ per bit.* In Oklahoma, Security H7 bits (bottom row, 2nd from left) punched through hard Arbuckle limestone for toolpusher Page Arnall of Riceland Corporation to the tune of 53.7′ per bit, an average of 4′ more hole than competitive bits.

Bit records like these are being recorded every day by progressive toolpushers the world over. But records in themselves are not important, rather the lower cost per foot hole drilled by Security bits. You'll know this difference when costs are posted on your balance sheet, the only record that really counts.

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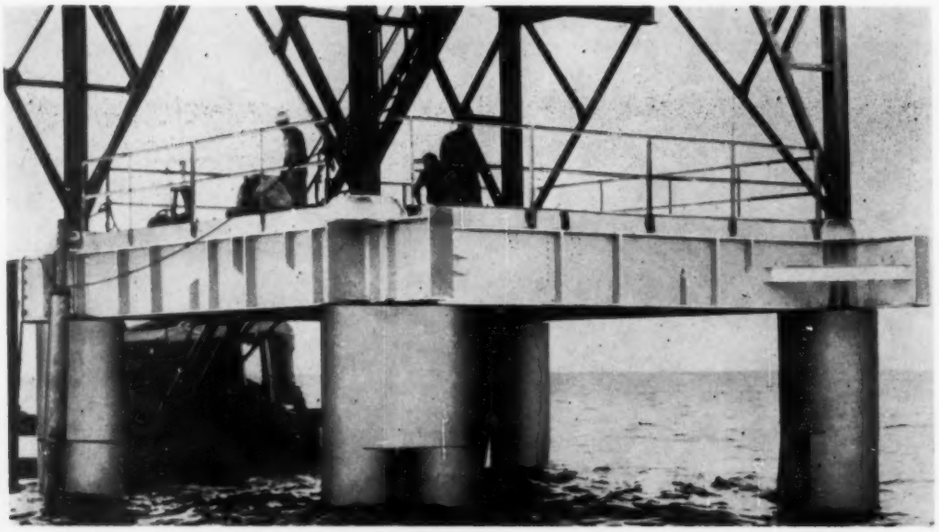

Prestressed storage islands similar to the one illustrated here are stated to play an important role in eliminating shore congestion caused by bulk storage and tanker loading facilities around Lake Maracaibo. This design consists of six 180,000 barrel capacity concrete tanks, each measuring 180 ft. in diameter. The 244-ft. diameter platforms with 22-ft. walls supported on prestressed cylinder piles are connected with catwalks. Total capacity of the installation will be 1,080,000 barrels. Construction is by Raymond Concrete Pile Co. which has set up a new yard at the Lake for their production.

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A proven product of constant performance research, interchangeable "Blue Demon" Blades are forged of high yield alloy steel to stand the greatest strain on bottom . . . wear-resistant tungsten carbide inserts are uniformly brazed on cutting edges . . . consistent heat-treating is controlled for maximum structural strength . . . and blades are ground to exacting specifications which permit the fastest cutting characte. ,tics without sacrifice of life.

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India Orders More Soviet Turbos

A supplementary agreement for a supply of turbo drilling equipment from the Soviet Union was signed in New Delhi, May 11. The agreement modifies an earlier agreement of May 1956 for a supply of conventional rotary-type drills, along with geophysical and seismic equipment at a cost of about $2.7 million.

Under the present agreement, the USSR will supply drilling rigs, designed for forced turbine and rotary drills of oil and gas prospecting up to a depth of nearly 16,000 ft. The modification involves an additional expenditure of about $400,000, and covers a supply of cement and additional workshop units also. First consignment of equipment was to be delivered in May, the second by October 1957, and the third by December.

BP's Grangemouth Refinery Expanding

Processing capacity of British Petroleum Co.'s Grangemouth refinery in Scotland is to be raised by nearly 20,000 b/d-to 62,000 b/d from 44,000 b/d—at a cost of some $12 million. This increase will be brought about by replacing an existing crude distillation unit by a larger plant. Ancillary refining units are also to be added, as well as extra tankage and other facilities.

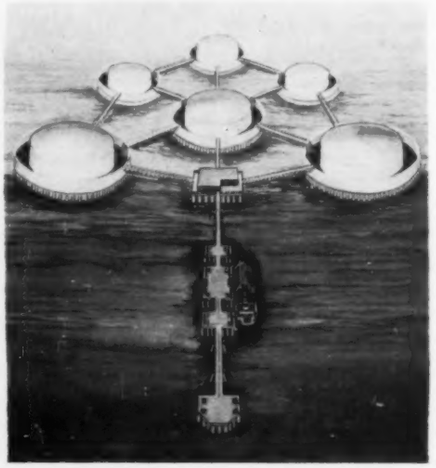
The refinery's increased processing capacity of 62,000 b/d will approximately equal the annual carrying capacity of the 57-mile pipeline which brings crude to Grangemouth from the Finnart tanker terminal at Loch Long, on the west coast of Scotland. At Finnart a new jetty, capable of taking the largest tankers, is to be built. The expansion at Grangemouth is due to be completed in 1959, and that at Finnart towards the end of 1958.

Israel Imports 98% Requirements

Because of the heavy increase in the use of electricity in Israel, the problem of increasing the importation of oil is paramount. All the oil used in Israel must be imported except about 2%—from the Heletz field. The finding of salt water in recent drillings in the Heletz field has resulted in a limitation on the acreage per well to 80 acres. Of the 15 wells begun, eight are now in production with an average reported output of 112 b/d. The government has estimated the capacity of the field at 10 million barrels.

The Haifa government last December began the construction of an 8-in. pipeline from Eilat to Beersheba. This line has been constructed at a cost of $20 million, and the first oil arrived at Beersheba in April of this year. The extension of the line to the coast by 16-in. pipe is to be completed in July. Capacity of the pipeline from Eilat to Beersheba is estimated to be nearly 16,000 b/d. In 1956 Israel consumed about 27,000 b/d of petroleum.

In 1956 Israel's fuel bill was more than $42 million, an increase of about $5 million a year. This accounts for the pressure for an increase in pipe line capacity in Israel.



One of many derrick bases being built in Lake Maracaibo by Raymond Concrete and Pile Co. for oil companies. Introduction of the prestressed concrete cylinder pile, made in units at a shore base and assembled for use in almost any depth in the Lake, has opened up opportunities for operators in many parts of the Lake not available before. (Photo courtesy of Raymond Concrete Pile Co.)

WHETHER IT'S OIL...

Pemex of Mexico operates this Autocar DC103-197" with 275 H. P. Diesel Engine. Handles 6600 gallon tanks from refinery to central region of Mexican Republic.

This Autocar C85T has 158" wheelbase, equipped with 4800 gallon tanker, is now operating for Penn-Port in Manizales, Columbia, S. A.

Creole Petroleum Corp., in Caracas, Venezuela, is now operating this husky new Autocar DC10364S tanker with extra-capacity double tank trailer from refinery to storage stations. It has 158-inch wheelbase, 275 horsepower super-charged diesel and power steering.

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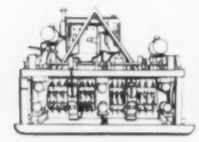
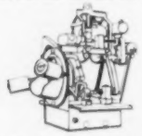
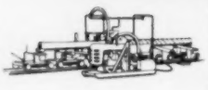


stationary cleaning & priming machine



line traveling coating & wrapping machine

pipeline cradles



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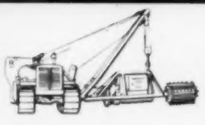
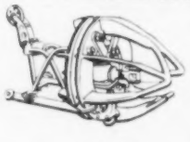


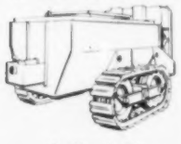
ditch padder



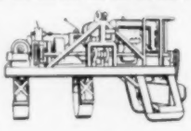
internal line up clamp

pipe cutting & beveling machine

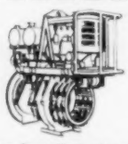
Cinch hydraulic pipe bending machine



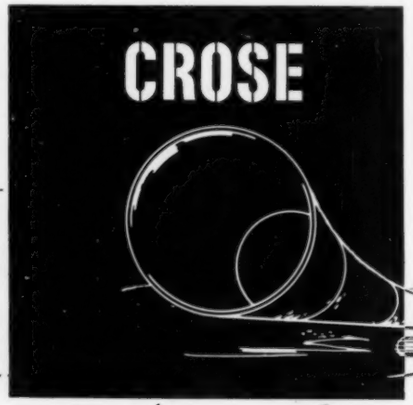
pipeline kettles

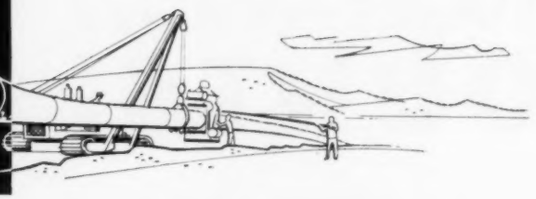


road boring machine



line traveling cleaning & priming machine





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Granted Floating-Roof Patent

Nooter Corp., of St. Louis, a newcomer in the field of floating roofs, has been granted patents on a new, special two-point suspension seal hanger. Robert J. Ryan, Nooter president, announced that all 10 claims submitted on the seal have been approved by the US Patent Office.

A feature of the seal is the placement of all of the operating mechanism beneath the roof. The Nooter seal is adaptable to the double-deck, pontoon- and pan-type roofs fabricated by Nooter, as well as to any existing type of floating roof. It also can be installed, in a modified shoe design, in existing riveted tanks.

Tretolite Develops Flood and Disposal Stimulator

"Fludex," a new multipurpose chemical formulation for operations where combined scale, corrosion, and bacteria contribute to malfunctioning of waterflood disposal systems, has been announced by Tretolite Co., of St. Louis, Mo. It is particularly useful where incompatability of certain treating agents may add further complication when two or more of these forms of attach are involved.

Sinclair Management Changes

Effective June 1, management changes following the pattern of the parent Sinclair company announced February 1, took place in Sinclair Oil & Gas Co., producing subsidiary in Tulsa, Okla., as follows:

H. B. Smith has been elected chairman and chief executive officer, succeeding H. L. Phillips, who remains a director. W. H. Morris has been elected president, succeeding Mr. Smith. He also has been named a director. J. W. Jordan has been elected vice chairman of the board. J. N. Johnson becomes executive vice president for administration and a director.

Oil Consultants Released

In view of the improved supply and transportation situation, Secretary of the Interior Fred A. Seaton has announced the release of the 12 petroleum consultants who assisted the deparment during the recent Suez crisis and oil lift to Europe.

Brazil Ups Refining

Expected 1957 output of the oil refinery at Cubatao, Brazil, is 120,000 b/d. During 1956, the refining of crude amounted to 75,000 b/d, up from 65,000 during 1955. Some 81% of the revenue for Petrobras comes from oil refined at the Cubatao plant, which is located between Sao Paulo and Santos. In 1956, the value of production was Cr. $7,000,000,000; and in 1957, it is expected to rise to Cr. $10,000,000,000.

Officials of the plant explain the refinery is being equipped with machinery to expand petrochemical operations. New types of solvents are to be produced through use of gas residues. Installation of equipment to convert some of these gas residues into special fertilizers has begun. A new plant is to start operations in October to produce ethylene, which never before has been manufactured in the country. Ethylene is used for production of styrene and for plastics. Production of methanol is being planned as part of the petrochemical expansion.

Internal Gas-Line Sealants

Arvel C. Curtis, president of the Pipelife Corp. Tulsa, discussed the "Development of Internal Sealants For Gas Lines," in an address before the recent production conference of the American Gas Assn. He spoke of the giant strides in the form of a "major revolution" made in the development of these internal sealants and coating for pipelines.

He pointed out that it is believed that 100% seals can be had on gas-distribution systems where cast-iron pipe with bell-and-spigot leaded joints are used, when applied with the in-place method, and enumerated the many benefits obtained from the application of coatings and sealants applied to pipelines under ground.

Consolidates Offices

The Cornell Oil Co. has consolidated its offices in Lubbock, Texas, with its office in the Meadows Building in Dallas. All executive offices of the company will be housed in the Cornell Building just completed in Dallas at 4616 Greenville Avenue. The company is a producer with properties in Oklahoma and Texas.

Jamaicans Use More Products

Consumption of petroleum products in Jamaica is expected to rise 8% this year over last. Meanwhile, 1956 consumption was 10% ahead of 1955. These estimates come from four oil companies operating in the country and the government. Imports of motor gasoline, for example, came to 15,349,293 imperial gallons in 1956. Imports of aviation gasoline, whose use rose 15% in 1956, came to 6,229,712 imperial gallons.

Use of motor fuel is on the rise, with more motor vehicles. The government's effort to slow down use of large American-made automobiles is not expected to slow down future demand much. Gas oil use is due to expand with growing operations of bauxite companies, coming of new industries, and the fact that gas oil is duty-free. Further, as gasoline-using trucks wear out, they are being replaced with ones using gas oil.

New AAODC Chapter

Drilling contractors of Four Corners and San Juan Basin have organized a new chapter of American Assn. of Oilwell Drilling Contractors—to be known as Farmington Regional Chapter. J. M. Riddle, Moran Bros. Inc., is chairman; and Robert B. Jackson, Empire States Drilling Corp., vice chairman—both of Farmington, N. Mex.

Panhandle Regional Chapter became the 18th with its first formal meeting in Pampa, Texas, April 30. Chairman is E. E. Simmons, Cree Drilling Co.; vice chairmen are Max E. Banks, Baker & Taylor, Amarillo; D. E. Holt, Holt Bros. Drilling Co., Pampa; and C. N. Dunham, Midwester Drillers Inc., Liberal, Kans. F. N. Hills, Hills & Hills Drilling Co., Pampa, is secretary-treasurer.

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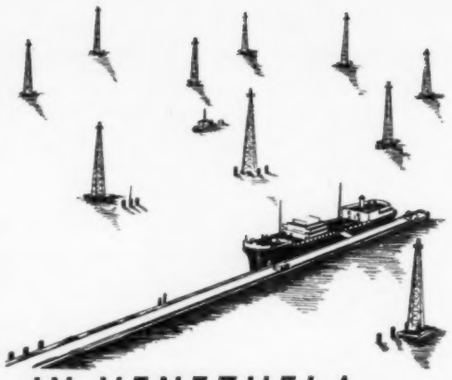

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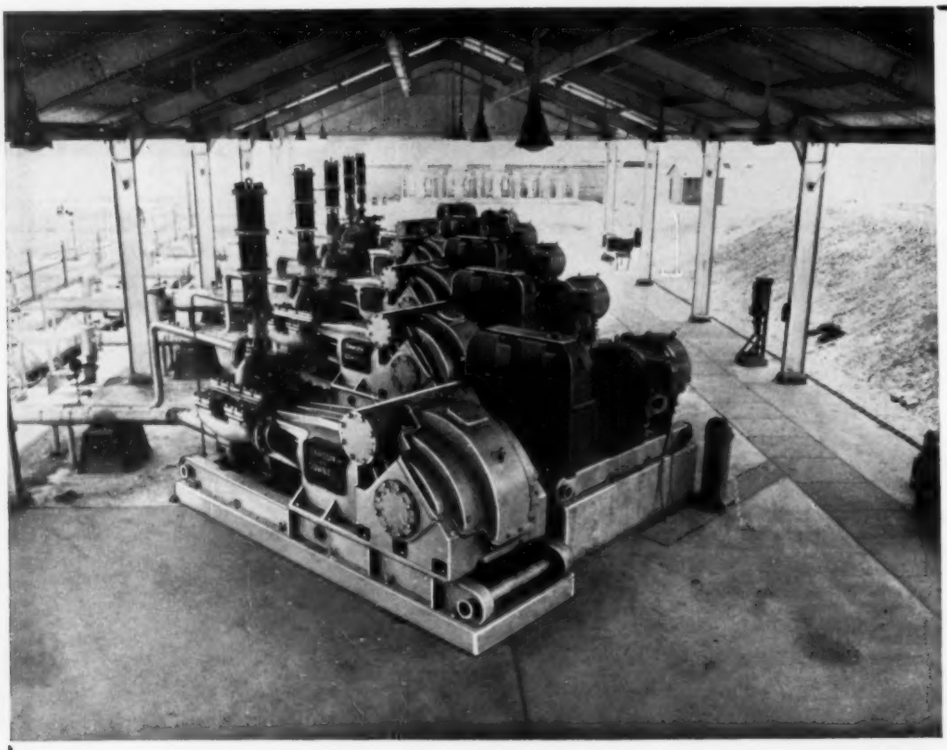

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General view of cone roof tanks and Horton Pontoon roof tanks at the Compania con Solidada De Petrolo Refinery at Puerto La Cruz, Venezuela. (Erected by Chicago Bridge & Iron Company Limited, Caracas.)

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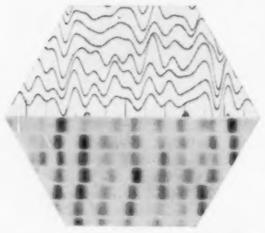

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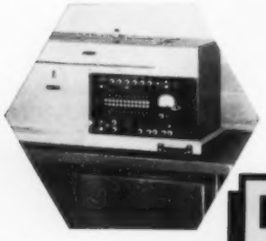

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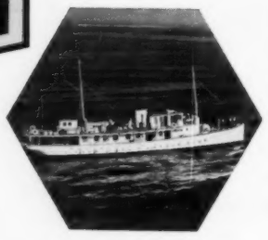

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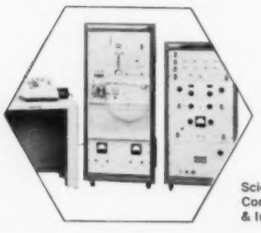

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van Griethuysen President Conoco Venezuela

T. A. van Griethuysen, Houston, has been elected president and a director of Continental Oil Co. of Venezuela, according to announcement of L. F. McCollum, president of the parent Continental Oil Co. Formerly vice president for transportation and supplies for the parent company, van Griethuysen will direct operations of the recently organized Conoco subsidiary from his new headquarters in Caracas. van Griethuysen joined Conoco at Ponca City, Okla., in 1929, and served in various capacities before he became manager of crude-oil trading in 1948 and Conoco vice president in 1953.

Charlton Kerr, Caracas, a member of Conoco's geophysical staff for almost 20 years, has been elected vice president, exploration manager, and a director of Continental Oil of Venezuela. He will continue to make his headquarters in Caracas. Mr. Kerr became a geophysical supervisor with a Conoco affiliate in British Somaliland in 1954, and has been a Conoco staff geophysicist in Venezuela since 1955.

Oil's Assets Large

Twenty-one petroleum companies commanded the biggest share of industry's total assets in 1955, according to the National Industrial Conference Board. In a survey of the 200 largest manufacturing corporations, over 30% of the total assets of the top 100 went to the petroleum industry. Motor-vehicle and steel industries ranked second and third, with 14% and 13% of the total. General Motors led all corporations, with nearly $7.6 billion in total assets. Standard Oil of New Jersey followed with assets over $7 billion, more than $6 billion sales, and 153,000 persons employed; United States Steel was third, with nearly $4 billion in total assets, $4 billion sales, and 272,646 employees.

Nuclear Radiation Oil Research

One of the world's largest and most fully-equipped nuclear radiation laboratories will be built at the Texaco Research Center, Beacon, N. Y., according to announcement of Frederick H. Holmes, vice president in charge of The Texas Co.'s Research and Technical Department. Construction will start immediately, and is expected to be completed by April 1958. All applications of nuclear energy to oil operations will be explored.

Desk & Derrick Middle East Seminar

A seminar for the Association of Desk & Derrick Clubs of America was sponsored by Rutgers University at Princeton, N.J., June 1—covering Middle Eastern oil and its economic significance. Speakers included the Hon. Moussa Shabandar, ambassador to the USA from Iraq; and S. K. C. Kopper, of Arabian American Oil Co. Chief purpose of D & D, an organization for women employed in oil, is to aid women to become better employees through D & D-sponsored educational programs.

FROM AKABA TO BANDAR ABBAS

From Mosul to Muscat—the lands of the Middle East, holding some 58% of the world's known crude oil reserves. The oil wells that have been sunk here and are still being sunk, are part of the gigantic oil industry, the greatest single factor in international trade, which has revolutionised the economy of the world in the space of the last fifty years.

In most of the areas where drilling, or exploration, are in progress, Paxman diesels will be found, giving unfailing service driving draw-works, rotary tables and slush pumps. These engines come from a range of "Package" sets, developed from 16,000,000 hours of drilling experience, which oil men everywhere know for their sound performance, rugged construction and dogged dependability.

Paxman engines for oilfield duty are built in a 7" bore range of 128 to 800 s.h.p. with fluid coupling, torque converter, power take-off clutch, or diesel-electric drive and a 70% interchangeability of wearing parts. Also in a 9¾" bore range of 450 to 1,800 s.h.p., of fabricated steel construction with fluid coupling or diesel-electric drive, giving power to spare for the largest outfit.

TRUCIAL COAST Shuweihat No. 1. rig with Paxman-engined draw works. **RUMAILA** A machine minder at work on the Paxman-engined rig. *(B.P. photographs)*

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JAMBUR A general view of the drilling rig at Well No. 5 Jambur Field near Kirkuk. *(From a B.P. photograph)*

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Oil Company Staff Changes

GROVER E. LEDLIE, Jr., has been appointed administrative assistant to the president, in charge of exploration, of Falcon-Seaboard Drilling Co., Tulsa. Mr. Ledlie, most recently, was a private petroleum consultant in Denver, Colo.

O. D. THOMAS has been appointed to the newly created position of foreign exploration director of the foreign department of Phillips Petroleum Co. J. R. Leonard, formerly division exploration geologist for Phillips at Amarillo, Texas, succeeds Mr. Thomas as southwest regional geologist in the land and geological department at Bartlesville.

J. K. (Ken) ABELL has been appointed manager for Halliburton Oil Well Cementing Co.'s subsidiary operations in Argentina, Bolivia, Brazil, and Chile. He has also been awarded a 20-year service pin. Mr. Abell will have offices in Buenos Aires for Halliburton Argentina SA.

DAVID H. SCOTT has joined Signal Oil and Gas Co. as chief geologist. The company president pointed out that Signal's exploration activities are rapidly expanding in this country, Latin America, and other widespread areas of the world.

NORMAN W. MARTISON has been named exploration manager of Colorado Oil and Gas Ltd. A native of Toronto, Ontario, Mr. Martison spent five years in mining in Ontario and Quebec, and has had considerable experience in eastern and western Canada in the oil industry, filling various capacities for 12 years with Shell Oil Co., including 3½ years as division exploration manager in Regina.

W. R. G. MACLACHLAN has been appointed general manager of British-owned Assam Oil Co. Ltd., Digboi, Upper Assam, India—succeeding D.C. Robertson, retired after 29 years' service. Mr. Robertson has served in all the operational spheres of The Burmah Oil Co. Ltd., of which Assam Oil is the Indian subsidiary.

HENRY C. CORTES, vice president and director of Magnolia Petroleum Co., has received the honorary degree of doctor of science, awarded by the board of regents of The University of the South, at Sewanee, Tenn. Mr. Cortes now has management charge of coordinating Magnolia's offshore operations and of the company's field research laboratory near Dallas.

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HINES H. BAKER has been elected a vice president of Standard Oil Co. (New Jersey) and a member of the executive committee. He formerly was president and a director and chief executive officer of Humble Oil & Refining Co., a Jersey affiliate.

H. A. COTTIN and J. F. Holmes have been appointed assistant comptrollers of Creole Petroleum Corp. Mr. Cottin, a Venezuelan citizen, has had 22 years of service with Creole in Venezuela. Mr. Holmes joined Creole in 1948, and at present is in the company's office in Caracas.

FRED W. BARTLETT has been elected vice president in charge of producing, Socony Mobil Oil Co. Inc. New York—succeeding John C. Case, retired after 45 years of service. Mr. Bartlett joined Socony Mobil in 1939 after 17 years of oil experience in the USA and Mexico. He was appointed chief geologist of Socony Mobil Oil Co. de Venezuela, holding that position until moving to Socony Mobil headquarters in New York as assistant chief geologist in 1943.

G. H. HERRIDGE has been appointed managing director of Iraq, Baarah, and Mosul Petroleum Companies—effective June 30—upon the retirement after 7½ years' service, of Sir Stephen Gibson. H. W. Fisher becomes an executive director, with the title of joint managing director.

Mr. Herridge joined Turkish Petroleum Co., in 1926 (which became Iraq Petroleum Co. in 1929). In 1934 he was attached to the office of the general manager in the Middle East, with responsibility for organization of geological and exploration parties. In April 1943 he was appointed assistant general manager of company operations in the Middle East, where he was responsible for the companies' relations with the Iraq, Syrian, Lebanese and Jordanian governments. In 1947 he was appointed general manager in the Middle East, and at the end of 1951 he went to the London headquarters. In January 1953 he was appointed an executive director of the Iraq Petroleum group of companies.

Mr. Fisher joined Standard Oil Co. (N.J.) in 1927. In 1945, he became a director of Esso Standard Oil Co. and president of Enjay Co. Inc. In 1951 he was appointed coordinator of refining for Jersey Standard's worldwide refinery operations. He has resided in London since 1954 as Jersey Standard's shareholders' representative in the UK and chairman of its coordination committee for Europe.

RICHARD P. COCKE has been elected vice president of the Trans-Arabian Pipe Line Co. He has served as secretary, treasurer and comptroller since 1951, and will continue to fill the duties of secretary and treasurer. He will be succeeded as comptroller by O. T. Swanson, who has been Tapline's assistant comptroller and assistant treasurer.

JOHN H. THACHER will succeed S. Z. Natcher, in London, as president of Iran California Oil Co., subsidiary which manages Standard Oil Co. of California's interest in the Iranium consortium. Mr. Thacher has been serving as vice president of Standard of California's research subsidiary, California Research Corp., with responsibility for oilfield exploration and production research. Mr. Thacher was recently named head of Standard's public-relations department.

BERT C. TIMM has been named chief geologist for Sunray Mid-Continent Oil Co., Tulsa, Okla. Thomas A. Clote has been named division geologist for the Oklahoma division, area previously handled by Mr. Timm. Walter J. Slagle becomes division geologist for the West Texas-Southeast New Mexico area, replacing Mr. Clote. Russell J. Ford becomes district geologist, post previously held by Mr. Slagle. Chief geophysicist for the company is Stefan Von Croy. Two other division geologists are also headquartered in the Tulsa home office, viz., Sherrill A. Shannon, who heads Sunray's geological operations in Kansas, Colorado, Utah, Montana, North Dakota, and Wyoming; and Watson Caldwell, who directs geological activities in South and East Texas, Louisiana, Arkansas, and Mississippi.

R. A. HUNTER has been appointed coordinator of all marketing—both domestic and foreign—of Gulf Oil Corp. He will be responsible for coordination of all marketing activities of Gulf around the world where the company has operations. E. L. Hemming has been placed in charge of retail and jobber sales in the domestic marketing department. H. E. Bower has assumed the duties of resale outlets development in domestic marketing. All three men are veterans of long service with Gulf.

J. W. MACKEY has been appointed superintendent of operations and maintenance, pipeline department, British American Oil Co. Ltd., of Canada. He joined Canadian Gulf after 28 years' service with Gulf Refining Co., Gulf Oil Corp. subsidiary. At time of acquisition of Canadian Gulf Oil Co. and its subsidiaries by British American in 1956, Mr. Mackey was construction superintendent of Canadian Gulf Pipe Line Corp. In his new position, he will be located at Edmonton, Alberta.

WILLIAM H. "BILL" WAGNER has been appointed advertising and public-relations manager for Pacific Pumps Inc., Huntington Park, Calif., a member of Dresser Industries of Dallas, Texas. The appointment was made by E. J. Weis, executive vice president of Pacific Pumps.

A. B. BROWN has been elected president of Richmond Exploration Co., according to announcement of T. S. Petersen, president of Standard Oil Co. of California. Richmond Exploration is a South American producing and exploration subsidiary of California Standard, and operates in Venezuela. Mr. Brown succeeds C. R. Cabrera who recently was appointed to Standard's executive staff.

ELINOR L. MARTIN, of Mt. Kisco, N. Y., has been appointed assistant secretary of Standard-Vacuum Oil Co., at the company's White Plains, N.Y. headquarters. She succeeds Eleanor C. Dickson, of Irvington, N. Y., who was named secretary of the company in April.

FRED POWELL, previously manager manufacturing department of Western Operations Inc., has become a vice president and director of Standard Oil Co. of California.

ROBERT H. MILBRATH and Thomas W. Moore have been elected directors of Esso Export Corp. and members of the executive committee. Mr. Milbrath also has been elected a vice president.

A graduate of the US Naval Academy, Mr. Milbrath joined Standard of New Jersey in 1934, and later transferred to Argentina as vice president and general manager of Jersey's affiliate there. Mr. Moore also began with Jersey in 1934, as engineer at the Bayway, N.J., refinery. Since 1954 he has been assistant manager of Jersey's coordination and petroleum economics department.

R. G. FOLLIS has been appointed chairman of Trans-Arabian Pipe Line Co. Mr. Follis, who is also chairman of Standard Oil Co. of California, succeeds Clyde A. Swigart, retired. John Noble, president of the company, will also become chief executive officer. Mr. Noble resides in Beirut, Lebanon, headquarters of Tapline.

W. K. (Jug) WATERS, division manager for Otis Engineering Corp., Corpus Christi, Texas, has been transferred to its South American subsidiary, Servicio Tecnico de Pozos "Otis" CA in Maracaibo, Venezuela.

Bob Crain, veteran manager of the firm's Oklahoma City division, has been transferred to Corpus Christi as division manager. Duane Johnson, superintendent for the Otis division in New Iberia, has been promoted to district manager in Oklahoma City to replace Mr. Crain.

C. W. HAMILTON, vice president, Gulf Oil Corp., and chairman of Gulf Eastern Co., London, England, retired as of July 1. A veteran of more than 41 years of service, he joined Gulf in 1916 as chief geologist for the Mexican Gulf Oil Co.

RAY FISH, prominent Houstonian and gas-industry leader, was awarded an honorary degree of doctor of business administration at Denison University, Granville, Ohio, for significant contributions to gas-transmission industry.

JOHN C. HOSTETLER, consultant and specialist in oil property management and water flooding, has organized Hostetler Engineering—with headquarters at Monahans, West Texas.

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RUST AND FOULING IN PIPE LINES	**KONTOL "77"** Corrosion Inhibitor
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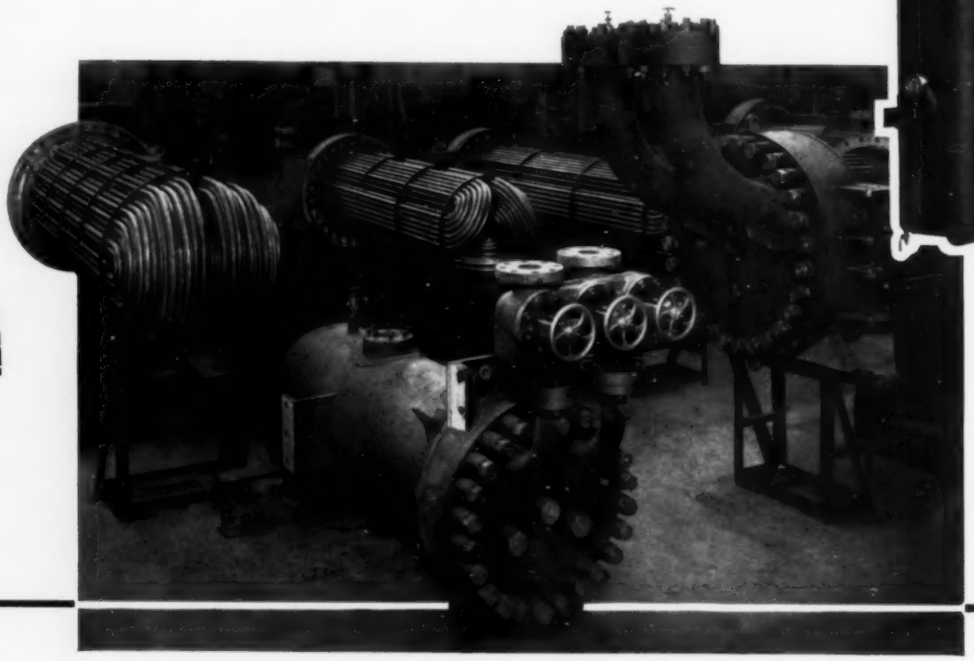

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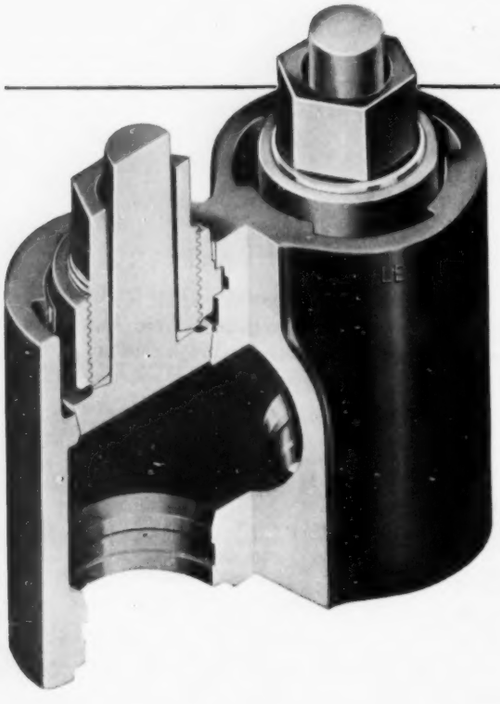

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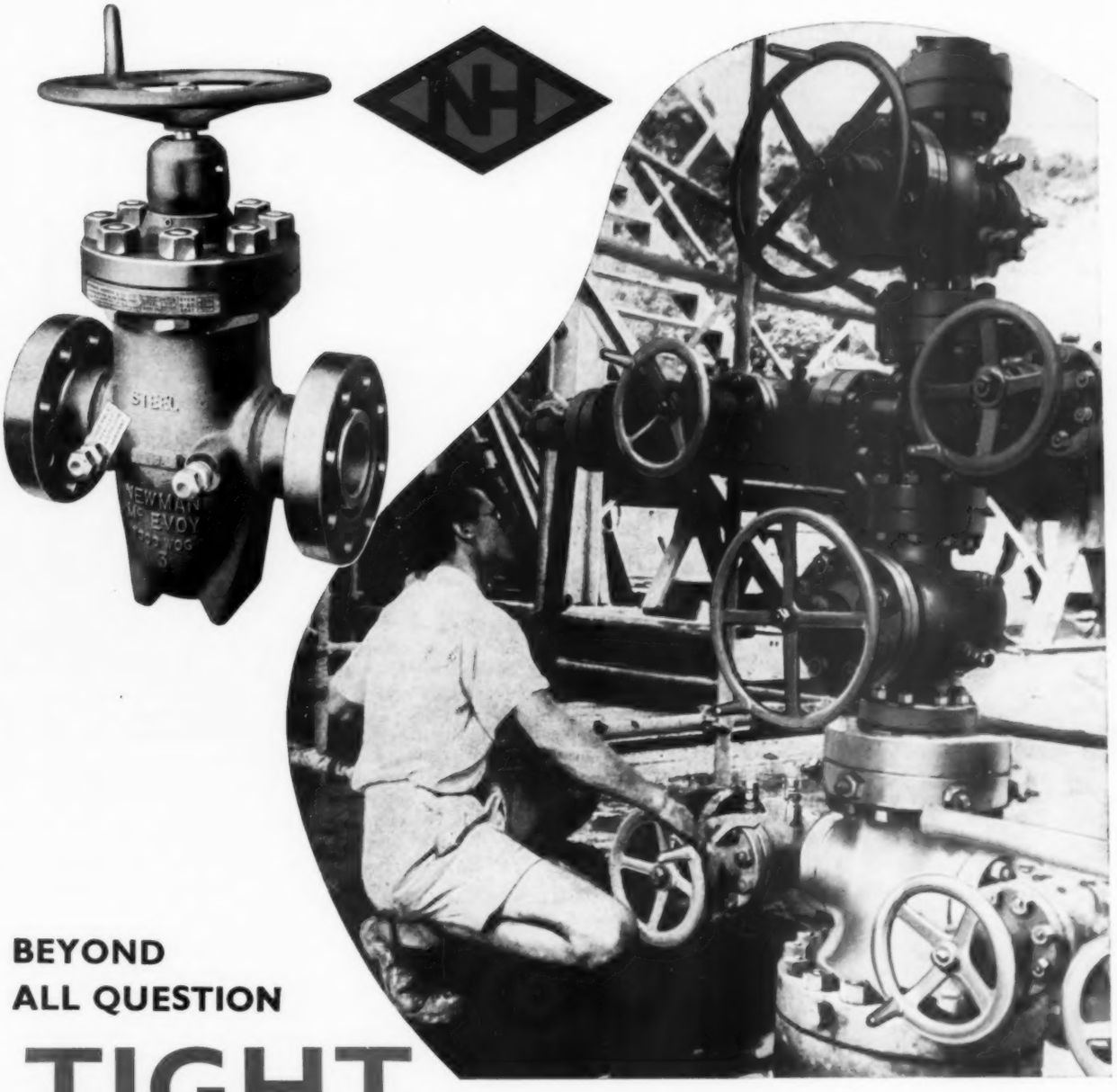

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Venezuela Oil

(Continued from page 134)

TABLE V
EXPORTS OF CRUDE OIL AND REFINED PRODUCTS FROM VENEZUELA AND NETHERLANDS ANTILLES
YEARS 1947-1956 (Thousands of Barrels Daily)

Destination	1947						1952				1953					
	Crude	%	Products	%	Total	%	Crude	%	Products	%	Total	%	Crude	%	Products	%	Total	%
United States	218.5	53	140.8	20	359.3	32	337.0	51	332.9	30	669.9	38	327.9	50	324.7	31	652.6	38
Canada	77.1	19	9.3	1	86.4	8	139.4	21	16.5	2	155.9	9	156.2	24	17.7	2	173.9	10
Central America and Caribbean	9.2	2	60.4	8	69.6	6	42.6	6	86.4	8	129.0	7	40.0	6	87.5	8	127.5	7
South America	16.9	4	117.4	17	134.2	12	44.9	7	193.4	17	238.3	13	51.2	8	200.6	19	251.8	15
Europe	87.1	21	273.6	38	360.7	32	75.9	12	222.9	20	298.8	17	69.3	10	192.3	18	261.6	15
Africa	—	—	40.0	5	40.0	3	7.0	1	81.0	7	88.0	5	8.5	1	76.0	7	84.5	6
Bunkers	—	—	69.5		69.5		—		99.6		99.6		—		93.7		93.7	
Whalers	—	—	5.5	11	5.5	7	—	2	7.5	16	7.5	11	—	1	8.9	15	8.9	10
Other (Far East, Middle East, US Armed forces, unknown)	—	—	3.1		3.1		12.4		70.2		82.6		5.9		58.8		64.7	
Total Exports	408.8	100	719.6	100	1,128.4	100	659.2	100	1,110.4	100	1,769.6	100	659.0	100	1,060.2	100	1,719.2	100

	1954						1955				1956					
	Crude	%	Products	%	Total	%	Crude	%	Products	%	Total	%	Crude	%	Products	%	Total	%
United States	358.4	47	351.4	32	709.8	38	388.2	43	420.2	36	808.4	38	450.5	40	456.4	35	906.9	38
Canada	157.7	21	27.7	2	185.4	10	41.1	3	226.1	11	226.1	11	214.8	19	39.5	3	254.3	10
Central America and Caribbean	43.9	6	88.4	8	132.3	7	54.2	6	99.0	8	153.2	7	75.7	7	108.2	8	183.9	8
South America	59.4	8	210.9	19	270.3	15	101.7	11	166.4	14	268.1	13	128.5	12	172.4	13	300.9	12
Europe	121.0	16	180.4	17	301.4	16	169.7	19	232.8	20	402.5	19	228.4	21	274.5	21	502.9	21
Africa	9.6	1	83.8	8	93.4	5	8.4	1	73.4	6	81.8	4	12.2	1	76.0	6	88.2	4
Bunkers	—	—	96.4		96.4		103.3		103.3		103.3		—		125.0		125.0	
Whalers	—	1	9.5	14	9.5	9	10.0	13	10.0	8	10.0	8	—	3	8.5	14	8.5	7
Other (Far East, Middle East, US Armed forces, unknown)	10.7	—	44.2		54.9		3.7		31.3		35.0		3.3		39.0		42.3	
Total Exports	760.7	100	1,092.7	100	1,853.4	100	910.9	100	1,177.5	100	2,088.4	100	1,113.4	100	1,299.5	100	2,412.9	100

about the same as Latin America and Europe.

Essentially, all Venezuela-Netherlands Antilles sales are made fob purchaser's tanker at the loading port. Prices are influenced by the overall conditions prevailing in world markets, and are generally "posted prices," in USA dollars, i.e., quoted publicly in newspapers and trade publications. Current Venezuelan crude prices range from $2.80 to $3.37 per barrel, compared with $3.08 to $3.39 at USA Gulf, and $1.80 (Iran, heavy) to $2.69 (Iraq, light) in Middle East.

Obviuosly, tanker freight costs must be added to these prices in order to judge their relative competitive positions in various markets. The competitive advantage of proximity to marekts (Middle East with Europe; Venezuela with the USA East Coast) is reduced with a trend toward falling freight costs, such as might be expected in the long-term future, with the construction of numbers of large supertankers.

Tankers at Amuay awaiting oil export cargoes (photo, courtesy Creole Petroleum Corp.).

Venezuela may look with confidence to the future of her petroleum industry, which has just entered a new phase of expansion, stimulated by the granting of large areas of new exploitation and exploration concessions. The country is undergoing a phase of very rapid development, especially in communications, the presence or absence of which has been such an important consideration for the oil industry in the past. An example is the dredging of the Lake Maracaibo bar, which hitherto restricted traffic into and out of the lake to shallow-draft tankers of small size. Now, vessels of up to 35,000 tons and 33-ft draft may negotiate the bar, and the economic consequences for the whole Maracaibo basin will be profound.

However, the firmest basis for confidence is that which Venezuela shares with all other oil-producing countries—the phenomenal increase in energy requirements foreseen for the future. The world's energy needs may double within 20 years, and the main burden of meeting them will be borne by the petroleum industry. Venezuela's principal markets are likely to remain the United States, where demand for crude and fuel oil promises to stay strong; Europe, where rising energy needs and static coal production imply a growing dependence on petroleum; and Latin America, a region which has scarcely begun to industralize. Increasing competition is foreseen, especially from the Middle East. But the nature of demand in the important markets, with its emphasis on fuel oil, provides a strong reason for expecting Venezuelan exports of crude and products to continue growing at a healthy rate. END

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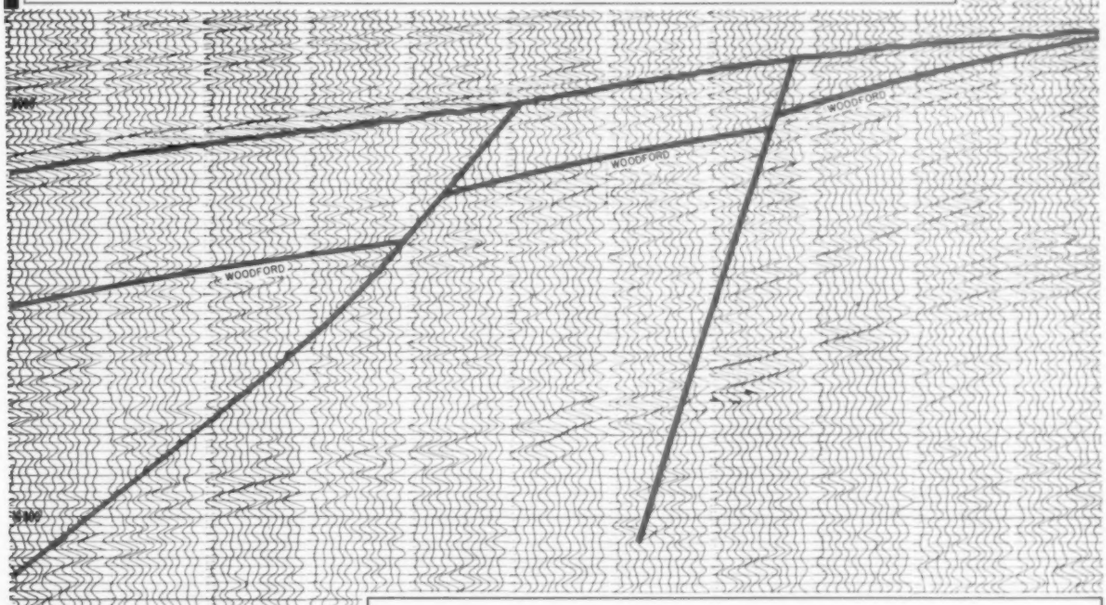

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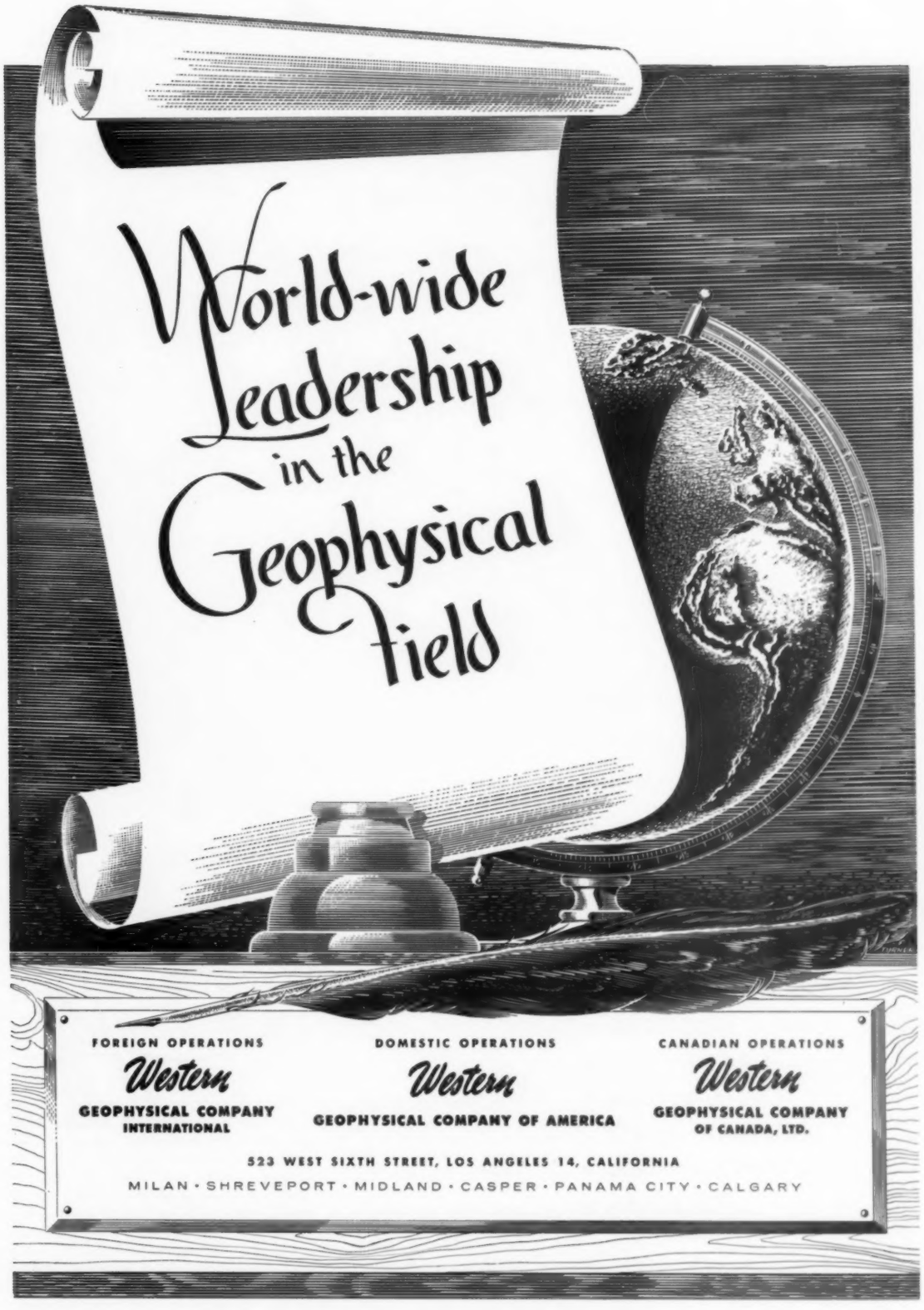
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